

38316/A
vol 31



LAMARCK

Engraved for the Naturalist's Library

THE

NATURALIST'S LIBRARY.

ENTOMOLOGY.

VOL. III.



EDINBURGH
W. H. LIZARS
LONDON SAMUEL HIGHLEY 32 FLEET STREET
DUBLIN W. CURRY JUN.R & C.O

76391

THE

NATURALIST'S LIBRARY.

EDITED BY

SIR WILLIAM JARDINE, BART.,
F.R.S.E., F.L.S., ETC., ETC.

VOL. XXXI.

ENTOMOLOGY.

FOREIGN BUTTERFLIES.

BY JAMES DUNCAN,
M.W.S., ETC.

EDINBURGH:
W. H. LIZARS, 3, ST. JAMES' SQUARE.
LONDON: S. HIGHLEY, FLEET STREET;
T. NELSON, PATERNOSTER ROW. DUBLIN: W. CURRY, JUN. & CO.
MANCHESTER: J. AINSWORTH, 93, PICCADILLY;
AND ALL BOOKSELLERS.

WELLCOME
HISTORICAL
MEDICAL
LIBRARY

Printed by W. H. Lizars, Edinburgh.

CONTENTS.

	PAGE
Memoir of Lamarck	17
Introduction	65
Genus Ornithoptera	87
Ornithoptera Priamus. Plate I. Fig. 1. . .	89
Ornithoptera Remus. Plate I. Fig. 2. . .	92
Genus Papilio	93
Papilio Memnon. Plate II. Fig. 1. . . .	97
Papilio Æneas. Plate II. Fig. 2. . . .	99
Papilio Ascanius. Plate III. Fig. 1. . . .	101
Papilio Paris. Plate III. Fig. 2. . . .	102
Papilio Protesilaus. Plate IV. Fig. 1. . .	104
Papilio Sinon. Plate IV. Fig. 2. . . .	106
Leptocircus Curius. Plate V. Fig. 1. . . .	107
Thais Medesicaste. Plate V. Fig. 2. . . .	108
Genus Pieris	110
Pieris Epicharis. Plate VI. Figs. 1 and 2. .	112
Pieris Philyra. Plate VI. Fig. 3. . . .	113
Pieris Belisama. Plate VII. Fig. 1. . . .	114
Genus Anthocharis	115
Anthocharis Danæ. Plate VII. Fig. 2. . .	116

CONTENTS.

PAGE

Genus Iphias 118
Iphias Leucippe. Plate VII. Fig. 3. . . . 119

Genus Callidryas 120
Callidryas Eubule. Plate VIII. Fig. 1. . . 122

Genus Terias 124
Terias Mexicana. Plate VIII. Fig. 4. . . 125

Genus Euplœa 126
Euplœa Limniace. Plate IX. Fig. 1. . . 127
Euplœa Plexippe. Plate IX. Fig. 2. . . . 128

Genus Idea 130
Idea Agelia. Plate X. Fig. 1. 131
Idea Daos. Plate X. Fig. 2. . . . 132

Genus Heliconia 133
Heliconia Erato. Plate XI. Fig. 1. . . . 135
Heliconia Cynisca. Plate XI. Fig. 2. . . . 137
Heliconia Sylvana. Plate XI. Fig. 3. . . . 138
Heliconia Flora. Plate XII. Figs. 1 and 2. . 139
Heliconia Diaphana. Plate XII. Fig. 3. . . 141

Genus Acræa 142
Acræa Pasiphæ. Plate XII. Fig. 4. . . . 143

Genus Cethosia 144
Cethosia Dido. Plate XIII. 145
Cethosia Cyane. Plate XIV. 147

Genus Vanessa 149
Vanessa Juliana. Plate XV. Fig. 1. . . . 150
Vanessa Amathea. Plate XV. Fig. 2. . . 151
Vanessa Orithya. Plate XV. Fig. 3. . . . 152
Charaxes Jasius. Plate XVI. 154
Nymphalis Etheocles. Plate XVII. Fig. 1. . . 157
Nymphalis Tiridates. Plate XVII. Figs. 2 and 3. 159
Peridromia Arethusa. Plate XVIII. Fig. 1. . 160
Peridromia Amphinome. Plate XVIII. Fig. 2. . 162
Marius Thetis. Plate XIX. Fig. 1. . . . 164

PAGE

Fabius Hippona. Plate XIX. Fig. 2. . . 167
Catagramma Condomanus. Plate XX. Figs. 1 and 2. 169
Catagramma Pyramus. Plate XX. Figs. 3 and 4. 171

Genus MORPHO 172
Morpho Helenor. Plate XXI. 174
Morpho Adonis. Plate XXII. Fig. 1. . . 176

Genus PAVONIA 178
Pavonia Teucer. Plate XXII. Fig. 2. . . 179
Arpidea Chorinæa. Plate XXIII. . . . 180
Helicopis Gnidus. Plate XXIV. Figs. 1 and 2. . 183
Erycina Octavius. Plate XXIV. Fig. 3. . . 185
Erycina Melibæus. Plate XXV. Figs. 1 and 2. . 187
Loxura Alcides. Plate XXV. Fig. 3. . . 188
Polyommatus Marsyas. Plate XXVI. Figs. 1 and 2. 190
Polyommatus Endymion. Plate XXVI. Figs. 3 and 4. 192
Polyommatus Venus. Plate XXVII. Figs. 1 and 2. 193
Polyommatus Achæus. Plate XXVII. Figs 3 and 4. 194

Genus THALIURA 195
Thaliura Rhipheus. Plate XXVIII. . . . 197

Genus URANIA 200
Urania Sloanus. Plate XXIX. Fig. 1. . . 202
Urania Leilus. Plate XXIX. Fig. 2. . . 203
Rhipheus Dasycephalus. Plate XXX. . . . 205

Portrait of Lamarck 2
Vignette, Title Page 3

In all, Thirty-two Plates in this Volume. With one Plate double, making the number equal to

THIRTY-THREE.

MEMOIR OF LAMARCK.

MEMOIR OF LAMARCK.

Among the many eminent French naturalists, whose loss to science we have so often had occasion to lament during the few past years, the above individual occupied a conspicuous place. He was long known in Paris by his public prelections, and his numerous writings have procured for him a high degree of reputation throughout Europe. In this country he is best known by his admirable works on invertebrate animals, which may be said to have formed a new era in the history of that extensive department of the animal kingdom. But his studies had a very extensive range; many of the most interesting inquiries which for ages have fixed the attention of mankind, were the subjects of his meditation, and on most of them he formed a number of definite ideas which he promulgated under the form of theories. Although these speculations are of a highly fanciful description, and some of them greatly to be deprecated on account of their hurtful tendency, yet they merit attention as the productions of a mind remarkable for originality

and penetration, as well as for extensive and varied knowledge.

Jean Baptiste Pierre Antoine de Monet, generally called the Chevalier de Lamarck, was descended from an ancient family of some distinction, possessed of considerable property in the province of Bearn. He was born at Bezantin, a small village in Picardy, on the 1st August, 1744. His father's pecuniary resources having become considerably impaired, among other things by the maintenance of a numerous family, Jean Baptiste being his eleventh child, he found it necessary to educate his sons for some useful profession. Several of them entered the army, and the subject of the present notice was destined for the church, which at that period offered many lucrative and influential appointments to the members of noble families. To qualify him for this office, he was sent to study under the Jesuits at Amiens, with whom he remained for a considerable time. From the first, however, he appears to have had some aversion to the profession selected for him by his father, and this was increased to positive dislike by the mode of life which he was obliged to lead at college. His active and excursive mind submitted with impatience to the punctilious restraints of college discipline, and the mechanical routine of studies prescribed indiscriminately to all, without reference to natural bias or acquired predilection. Most of his companions were actively engaged in the field or in other public services, for

France was now occupied with the eventful struggle which commenced in 1756. His eldest brother had fallen in the siege of Bergen-op-Zoom; others of them were still in the army; and all his most cherished associations were connected with the profession of arms. With so much to inspire an aversion to seclusion and comparative inactivity, nothing could have induced him to remain at college but the authority of his father, who still enforced compliance with his wishes. That salutary restraint, however, having been removed by death, in 1760, no time was lost by young Lamarck in following his own inclinations. With nothing but a letter of recommendation from a lady residing in the neighbourhood of his father, addressed to the colonel of a French regiment, he set out for the army, which was then in Germany. Lamarck's somewhat diminutive stature and boyish appearance, which made him look younger than he really was, were ill fitted to make amends for the want of influential patronage. His reception was by no means flattering, but nothing could daunt the zeal of the young volunteer. He joined a company of grenadiers, and determined to trust to fortune and his own exertions for obtaining that rank which individuals of his birth and education commonly acquire by other means.

Zeal like this seldom fails sooner or later in attaining its object, and in the present instance it was speedily rewarded. Lamarck had joined the army on the day preceding the battle of Fissingshausen, in which a vigorous but unsuccessful

attack was made by the combined troops of the marshal de Broglie and the prince of Soubise, on the army commanded by Prince Ferdinand of Brunswick. Cuvier relates*, that in the vicissitudes of the contest, the company to which M. Lamarck was attached happened to be thrown into such a position as completely exposed it to the fire of the enemy's artillery, and that, owing to the confusion which took place in the French army, it was entirely forgotten and left in that perilous situation. All the officers were soon killed, as well as the greater number of privates, when an old grenadier, perceiving that there were no longer any of the French within sight, proposed to the young volunteer, who by the death of the officers had unexpectedly acquired the temporary command, that the little troop should be withdrawn. This, however, he resolutely refused to do until he received regular orders to that effect, which at last were dispatched, when the troop were discovered to be missing, and reached him with the utmost difficulty, owing to the rapid advance of the enemy. This instance of intrepidity and vigorous adherence to orders gave so much satisfaction to the commander-in-chief, that he instantly issued an order for Lamarck's promotion. Some time afterwards, he was nominated to a lieutenancy, and his warmest anticipations

* See his *eloge* on Lamarck, of which a translation will be found in the Thirty-ninth Number of the Edinburgh New Philosophical Journal. To this memoir we have been chiefly indebted for the particulars of Lamarck's life.

of success, in a profession which he had made so many sacrifices to embrace, promised in time to be realized. But these prospects were speedily overclouded by an accident which completely put a stop to his military career, and gave a different complexion to the whole tenor of his life and habits. Some one of his companions, in sport, had lifted him by the head, and thereby strained so severely the glands of his neck, that he was for some time placed in the greatest danger. After many remedies had been tried to no purpose, a cure was at last effected by the celebrated M. Tenon, by means of a complicated operation. But his health had by this time become so much impaired, that after residing for a length of time in Paris in the hope of its amendment, he found it necessary to abandon all intention of rejoining the army.

In these circumstances it became necessary for him to think of some new occupation, and he seems not to have been long in forming a resolution to study medicine. His pecuniary circumstances, however, were so very limited, consisting of a pension of only 400 francs, that he was obliged in the mean time to employ himself as a clerk in the office of a banker in order to obtain the means of daily subsistence. The intervals he spent in study; and such were the buoyancy and activity of his mind, that even when his prospects were most discou raging, he never seems to have lost the expectation of rising to usefulness and distinction. He reverted with eagerness to the physical studies which he had

commenced at college, and soon showed a preference for certain departments of natural history. He delighted to engage in controversial discussions on these subjects with his companions, and to indulge in speculations respecting the most abstruse points in physics and the phenomena of the natural world. It is not improbable that it was about this time, when the wide and varied fields of science were just beginning to open to his view, that he conceived some of those crude and fanciful notions which characterise so many of his theoretical views. It is less a matter of surprise that such ideas should suggest themselves, at the outset of his career, to one of his ardent temperament and lively imagination, than that he should have persisted in maintaining them when his knowledge was more extended and his judgment matured, although in the opinion of almost every other person their fallacy appeared demonstrable.

Botany and meteorology were the branches on which he first bestowed the greatest degree of attention. Even before he left the army, he had become attached to the former; and during his stay at Monaco, had examined the singular vegetation of that rocky country. During his illness, he was lodged, for the sake of economy, in an apartment at the top of a high house, from which the clouds formed almost the only spectacle; and to relieve the tedium of his long solitude, he was accustomed to watch their varying forms and aspects, and carefully to observe all the other atmospheric pheno-

mena, indulging his fancy in forming conjectures about their nature and origin. This circumstance, he himself states, first inspired him with a desire to study meteorology; and we can perceive in these solitary meditations, one of the causes which tended to give their fanciful complexion to many of his subsequent speculations.

After continuing his physical studies with much ardour for several years, he at length appeared in the character of an author. His "French Flora, or a brief Description of all the Plants which grow naturally in France," was published in 1778. The immediate occasion of this work was a desire to furnish his fellow-students with a system of arrangement which should lead with greater ease and certainty to the determination of plants than any then in use. For this purpose he adopted a modification of the binary or dichotomous method, the principle of which consists in arranging natural objects by their positive and negative characters, dividing and subdividing always by two, and allowing a choice only between two opposite characters. Although this plan is, of course, highly artificial, and ill calculated to throw light on the affinities and analogies of objects, yet it is much recommended by its extreme simplicity, which adapts it to the comprehension of those who have but little acquaintance with the technical and descriptive language of natural history. If judiciously applied, it affords an easy index to particular genera and species, and renders the subject at once accessible without any

preparatory labour. Indeed, the principle on which it rests must to a certain extent be implied in every artificial system of arrangement.

This work soon acquired a considerable degree of popularity, not only by its intrinsic value, but from the seasonable time of its appearance. The study of botany, which had hitherto been confined almost exclusively to the members of the medical profession, was now becoming a popular and even fashionable pursuit; a distinction which it owed chiefly to the writings and example of J. J. Rousseau. Every work, therefore, calculated to facilitate the study, was likely to meet with a favourable reception among those who would probably have been repelled by dry technical details and rigorous scientific precision. Its publication had an important influence on Lamarck's fortune and prospects. It secured for him the friendship and patronage of M. de Buffon, who was then in the height of his popularity, and possessed of much influence, not only from his rank, character, and celebrity, but also from his authority with the government. Even its want of a very philosophical and precise system was probably one of the circumstances that recommended it to Buffon's attention, as it was thereby assimilated to his own writings, from which every thing of that nature was expressly excluded. Through his influence, an edition of the work was printed at the royal press, and its author introduced to the favourable notice of many of the leading savans of the day. He had soon an opportunity of turning his popularity to

some profitable account, for a place happening to become vacant in the botanical department of the Academy of Sciences, Lamarck was presented with the appointment, in preference to others of older standing and much higher pretensions. He thus acquired a certain status among men of science, which encouraged him to prosecute the studies which he had so successfully begun, and at the same time afforded him the means of doing so in a more efficient manner.

Another important advantage was derived by Lamarck from the friendship of M. de Buffon. When the son of the latter had completed his studies, and was about to make a tour through various parts of Europe, Lamarck was invited to accompany him as tutor; and in order that he might enjoy greater privileges by appearing in a kind of official character, Buffon procured for him a commission as botanist to the king, for the purpose of visiting foreign gardens and cabinets, and opening a correspondence between them and similar establishments in Paris. In this double capacity he travelled through various countries in the year 1781 and 1782; visited Gleditsch at Berlin, Jacquin at Vienna, Murray at Gottingen, and many other celebrated naturalists; greatly extending his acquaintance, not only with botany, but with many other branches of natural history.

The extent and accuracy of his botanical knowledge was evinced by the important works in which he engaged shortly after his return, which have

conferred on him a high reputation in this department. These consisted of voluminous contributions to the *Encyclopédie Methodique*, forming a *Dictionary of Botany*, and an extensive series of *Illustrations of Genera*. Of that portion of the Encyclopædia known by the former name, Lamarck wrote the whole of the two first volumes, and a part of the third, fourth, and fifth. The object of the work is to give a detailed history of plants, accompanied with descriptions, remarks on their synonymy, an account of their uses, and peculiarities of their structure. The Illustrations profess to afford "an exposition of the characters of all the plants established by botanists, arranged according to the sexual system of Linnæus, with figures displaying the characters of these genera, and a table of all the known species referable thereto, the description of which is found in the Botanical Dictionary of the Encyclopædia." This laborious work contains no fewer than two thousand genera, illustrated by half that number of quarto plates, executed with great care, and generally representing one or two of the typical species, with a view to afford a knowledge of their general appearance and habit. The flower and parts of fructification are carefully delineated, and the precision and accuracy of the whole work, renders it one of the most valuable that can be named for conveying a speedy knowledge of the extensive and interesting subject of which it treats. The zeal with which Lamarck laboured to produce works of such research and interest, is characteristic

of the temperament of his mind. He seems for a time to have allowed the subject wholly to engross his thoughts; to have occupied himself with nothing but plants, and to have associated almost exclusively with botanists. He was a frequent visitor at the house of M. de Jussieu, whose celebrity drew around him all who devoted themselves to this branch of science. Whenever a new collection of plants arrived in Paris, Lamarck was the first to inspect it; and when the celebrated Sonnerat returned from India in 1781, he was so much pleased with Lamarck's enthusiasm, as contrasted with the comparative indifference of most other naturalists, that he presented him with the magnificent herbarium which he had made in the east. It is to zeal like this that we are entitled to look for the achievement of the highest results in science.

Notwithstanding the patronage of Buffon, and others having the greatest influence with the government, it was long before Lamarck succeeded in obtaining any permanent and lucrative appointment. His chief dependence was on the casual and precarious engagements which he formed with booksellers, according to whose direction he was obliged to labour; a painful restraint to a man of genius, impatient to develope his own conceptions in whatever way he judged best fitted to render them effective. He was at length nominated by M. de la Billardiere, a relation of his own, to a place which seems to have been created expressly for him, by which the duty was assigned him of keeping the herbaria in

the king's cabinet. Although the emolument arising from this office was inconsiderable, and the tenure of it uncertain and invidious, for the National Assembly were called upon to suppress it as unnecessary, he continued to hold it for several years, till a change occurred which opened new prospects and entailed new duties. This happened in 1793, when the establishment known by the name of the king's garden and cabinet were remodelled and distinguished by the title of *Museum of Natural History*. The professors of the suppressed institution were appointed to superintend such departments taught in the new, as most nearly corresponded to their previous occupations; and as Lamarck was the last appointed, he was obliged to take charge of that branch unappropriated by the others, which happened to be the two extensive classes of the animal kingdom, named *Insecta* and *Vermes* by Linnæus.

A new direction was thus given to his studies, for zoology as a science had hitherto occupied but little of his regard. Indeed, the only knowledge of this subject which he possessed, directly available in his new station, seems to have been limited to *Testaceous Mollusca*, which attracted his attention at a pretty early period. But the occasion was just such a one as was best calculated to excite the natural ardour and energy of his character. He entered upon this new field of inquiry with the utmost eagerness, and cultivated it with so much skill and facility, that he was soon in a condition

to instruct others, and ultimately to produce works which will form a lasting monument to his fame.

Before engaging in the study of practical zoology, Lamarck had rendered himself conspicuous by the boldness and originality of his speculations regarding a variety of physical phenomena. The general laws of chemistry, the origin of the globe and its inhabitants, the condition of the atmosphere and of living bodies, and most other great questions fitted to attract an active fancy, had by turns been the subjects of his contemplation; and on many of them he had elaborated a theory which he conceived calculated to elucidate the most abstruse phenomena they presented. To these views he attached the highest importance, considering them destined to place almost every branch of knowledge on a new and secure foundation. He therefore took advantage of every opportunity to enforce and illustrate them, and they will be found to pervade most of his published works, even such as afford no obvious plea for their introduction. Although most of them are exploded as fanciful and untenable, these theories display much ingenuity and extensive knowledge, and a pretty full account of them is necessary to show the character of Lamarck's mind, and the wide range of his studies.

As early as 1780, he had presented his Theory of Chemistry to the Academy of Sciences; but it was not published for several years afterwards, when it appeared under the title of "Researches on the Causes of the most important physical Facts, and

particularly on those of Combustion; of the raising of Water in the State of Vapour; of the Heat produced by the Friction of solid Bodies against each other," &c. &c. A condensed view of the opinions promulgated in that work, and some others on the same subject, is thus given by Cuvier. According to our author, "Matter is not homogeneous; it consists of simple principles, essentially different among themselves. The connexion of these principles in compounds varies in intensity; they mutually conceal each other, more or less, according as each of them is more or less predominant. The principle of no compound is ever in a natural state, but always more or less modified: as, however, it is not agreeable to reason that a substance should have a tendency to depart from its natural condition, it must be concluded, that combinations are not produced by Nature, but that, on the contrary, she tends unceasingly to destroy the combinations which exist, and each principle of a compound body tries to disengage itself according to the degree of its energy. From this tendency, favoured by the presence of water, dissolutions result: affinities have no influence; and all experiments by which it is attempted to be proved that water decomposes, and consists of many kinds of air, are mere illusions, and that it is fire which produces them. The element of fire* is subject, like the others, to modification when combined. In its natural state, every-

* Memoir on the substance of fire, considered as a chemical agent in analysis.—*Journal de Physique*, *Floreal*, *An.* vii.

where diffused and penetrating every substance, it is absolutely imperceptible: only, when it is put in vibration, it becomes the essence of sound; for air is not the vehicle of sound as natural philosophers believe*. But fire is fixed in a great number of bodies, where it accumulates, and becomes, in its highest degree of condensation, *carbonic fire*, the basis of all combustible substances, and the cause of all colours. When less condensed, and more liable to escape, it is *acidific* fire *(feu acidifique)*, the cause of causticity when in great abundance, and of tastes and smells when less so. At the moment when it disengages itself, and in its transitory state of expansive motion, it is *caloric fire*. It is in this form that it dilates, warms, liquifies, and volatilizes bodies by surrounding their molecules; that it burns them by destroying their aggregation; and that it calcines or acidifies them by again becoming fixed in them. In the greatest force of its expansion, it possesses the power of emitting light, which is of a white, red, or violet-blue colour, according to the force with which it acts; and it is, therefore, the origin of the prismatic colours, as also of the tints seen in the flame of candles. Light, in its turn, has likewise the power of acting upon fire, and it is thus that the sun continually produces new sources of heat. Besides, all the compound substances observed on the globe are owing to the organic powers of beings endowed with life, of which, con-

* Memoir on the substance of sound.—*Journal de Physique*, 16 & 26 *Brumaire*, *An.* vii.

sequently it may be said, that they are not conformable to nature, and are even opposed to it, because they unceasingly reproduce what nature continually tends to destroy. Vegetables form direct combinations of the elements; animals produce more complicated compounds by combining those formed by vegetables; but there is in every living body a power which tends to destroy it; all therefore die, each in his appointed season, and all mineral substances, and all organic bodies whatsoever, are nothing but the remains of bodies which once had life, and from which the more volatile principles have been successfully disengaged. The products of the most complex animals are calcareous substances, those of vegetables are argils or earths. Both of these pass into a siliceous state, by freeing themselves more and more from their less fixed principles, and at last are reduced to rock-crystal, which is earth in its greatest purity. Salts, pyrites, metals, differ from other minerals, only because certain circumstances have had the effect of accumulating in them, in different proportions, a greater quantity of carbonic or acidific fire."

Lamarck's opinion regarding the origin of living beings, and the manner in which they acquired the various organs and forms which they now possess, are well known. They were first given to the public in 1802, in a work entitled " Researches on the Organization of living Bodies, on the Cause of its Developements, and the Progress of its Composition, and on that Principle, which, by continually

tending to destroy it in every Individual necessarily brings on Death." He conceives that the egg, for example, contains nothing prepared for life before being fecundated, and that the embryo of the chick becomes susceptible of vital motion only by the action of the seminal vapour; but if we admit that there exists in the universe a fluid analogous to this vapour, and capable of acting upon matter placed in favourable circumstances, as in the case of embryos, we will then be able to form an idea of spontaneous generations. The more simple bodies, such as a monad or a polypus, are easily formed; and this being the case, it is easy to conceive how, in the lapse of time, animals of more complex structure should be produced, for it must be admitted as a fundamental law, that the production of a new organ in an animal body results from any new want or desire which it may experience. The first effort of a being just beginning to develope itself, must be to procure the means of subsistence, and hence in time there came to be produced a stomach or alimentary cavity. Other wants, occasioned by circumstances, will lead to other efforts, which in their turn will produce new organs. One of the gasteropode molluscæ, for example, may be conceived to have felt the necessity, as it moved along, of exploring by touch the bodies in its path and to have made efforts to do so with some of the anterior points of its head, which would continually direct to that point masses of the nervous fluid, as well as other liquids: from these reiterated affluences

to the point in question, there would follow a gradual expansion of the nerves which terminate there; and as the nutritious and other juices likewise flow to the same point, it must necessarily happen that two or four tentacula would insensibly be produced. This is no doubt what happens in regard to all the gasteropode tribes, whose wants occasion the habit of feeling bodies by touching them with the parts of their head; and when such wants are not felt, the head remains destitute of tentacula, as may be seen in other instances, &c.* In like manner it is the desire and the attempt to swim, that had, in time, the effect of extending the skin that unites the toes of many aquatic birds, and thus the web-foot of the gull and duck were at last produced. The necessity of wading in search of food, accompanied with the desire to keep their bodies from coming in contact with the water, has lengthened to these present dimensions, the legs of the grallæ or wading-birds; while the desire of flying has converted the arms of all birds into wings, and their hairs and scales into feathers. Changes of this nature may appear to us contrary to what falls under our observation, which leads us to suppose that the specific forms of animals are constant; but this error is entirely owing to the difficulty we experience in embracing a considerable portion of time within the scope of our observations. It is from this cause that we cannot be ourselves witnesses of these changes, and neither history nor written observations extend to sufficiently remote a

* *Animaux sans vertébres*, vol. i. p. 188, 189.

date to convince us of our mistake. If we observe that the forms of the parts of animals are always perfect when viewed in relation to their use, as is really the case, it is not to be inferred that it is the form of the parts which has led them to be employed in a certain way, as zoologists assert, but that it is, on the contrary, the need of action which has produced the peculiar parts, and it is the employment of these parts which has developed them, and established a proper relation between them and their functions. To affirm that the form of the parts induced their functions, would be to leave Nature without power, incapable of producing any act, or any change in bodies; and the different parts of animals, as well as the animals themselves, as all created at first, would from that moment present as many forms as are required by the diversity of circumstances in which animals live; and it would be necessary that these circumstances should never vary, and that such should likewise be the case with the parts of each animal. Nothing, however, of this kind takes place, and nothing can be more opposite to the means which observation shows us that Nature employs to call into existence her manifold productions. It must hence appear, that what are called species do not exist in nature; that the constancy of races to which that name has been given, can only be temporary and not absolute, although they would no doubt continue the same as long as the circumstances which effect them undergo no change, and they are not forced to alter their ha-

bitudes. It is susceptible of demonstration, that if species had an absolute constancy, there would be no varieties, but naturalists cannot help acknowledging that such exist*.

Whatever changes circumstances may have produced in individuals, are all preserved by generation, and transmitted to new individuals emanating from those which have undergone these changes. Unless this were the case, Nature could never have introduced the diversity among animals which we now witness, nor a progression in the composition of their organs and faculties†.

Such is Lamarck's theory of life, and manner of accounting for the innumerable variety of forms in which living nature now appears. If his principles were once admitted, they would not only produce the effects he ascribes to them, but it would be a matter of surprise that natural productions are not infinitely more diversified than they really are, for nothing more is necessary than time and circumstances for any one animal form to be transformed into any other,—for a monad or a polypus to become indifferently a frog, an eagle, an elephant, or a man. But the two suppositions on which they rest, viz. that it is the seminal vapour which organizes the embryo, and that efforts and desires engender organs, are both so entirely arbitrary, and the latter so obviously fallacious, that very few have ever thought it worth while to attempt a formal

* *Aminaux sans Vertébres*, vol. i. p. 197, 198.
† *Ib.* p. 199.

refutation of them. It is difficult, indeed, to conceive how Lamarck could advance a theory so utterly opposed to observation and probability, and at the same time succeed so effectually in convincing himself of its truth. He must have perceived many of the inadmissible and absurd conclusions to which it led; yet he persists in maintaining it by a kind of sophistry which could impose on none but himself. He admits the value of observation and experience in the discovery of truth; but finding that they bore no testimony to the wonderful transformations he was desirous to prove, he gets rid of their evidence altogether, by alleging that they do not extend over a sufficiently lengthened period to take cognizance of these changes. The argument, therefore, on this point, virtually amounts to this, that observation gives no notice of these operations, but that instead of thence inferring that they do not take place, the proper conclusion is, that they are actually going on, and have been in progress since the creation! How indispensable unlimited time is to give an air of plausibility to Lamarck's theory, is strikingly evinced by the fact, of which he was perfectly aware, that we have the means of comparing animals that lived upwards of two or three thousand years ago, with the same species as they exist at present, and the conformity between them is found to be complete. Numerous quadrupeds, birds, reptiles, and insects, have been found embalmed in the Egyptian cemeteries, with all the parts in such a state of preservation as to be per-

fectly recognizable. "It would seem," says the professors of the museum at Paris, in their report on these valuable remains*, "as if the superstition of the ancient Egyptians had been inspired by Nature, in order to transmit to future times a monument of her history. By embalming with so much care the brutes which were the objects of their foolish adoration, that extraordinary and capricious people have left us, in their sacred grottoes, almost complete cabinets of zoology. The climate has conspired with the art of embalming to preserve bodies from corruption, and we can now satisfy ourselves, by our own eyes, what was the condition of many species three thousand years ago. It is difficult to restrain the transports of our imagination, when we behold thus preserved, with their minutest bones, the smallest portions of their skin, and in every respect most perfectly recognizable, many animals, which at Thebes or Memphis, two or three thousand years ago, had their own priests and altars." In regard to these curious relicts, Lamarck was forced to admit that they were identical with their living descendants in the same country, and accounted for it by saying that this happened because the climate and other physical conditions of the latter had long continued unaltered. But he makes no attempt to account for the fact which is so fatal to his theory, that these remains entirely correspond to individuals of the same species in many different quarters of the globe, where the physical conditions are so dis-

* Ann. du Museum d'Hist. Nat., tom. i. p. 234.

similar that they ought to have produced important changes*.

It will likewise be observed as an important defect in Lamarck's argument, that he can cite no positive fact to exemplify the substitution of some *entirely new* sense, faculty, or organ, in the room of some other suppressed as useless. "All the instances adduced," says Mr. Lyell, "go only to prove that the dimensions and strength of members, and the perfection of certain attributes may, in a long succession of generations, be lessened and enfeebled by disuse; or, on the contrary, be matured and augmented by active exertion, just as we know that the power of scent is feeble in the greyhound, while its swiftness of pace and its acuteness of sight are remarkable; that the harrier and staghound, on the contrary, are comparatively slow in their movements, but excel in their sense of smelling. We point out to the reader this important chasm in the chain of the evidence, because he might otherwise imagine that we had merely omitted the illustrations for the sake of brevity; but the plain truth is, that there were no examples to be found, and when Lamarck talks of 'the efforts of internal sentiment,' 'the influence of subtile fluids,' and the 'acts of organization,' as causes whereby animals and plants may acquire *new organs*, he gives us names for things, and with a disregard of the strict rules of induction, resorts to fictions, as ideal as the

* Lyell's Principles of Geology, ii. p. 31.

'plastic virtue,' and other phantoms of the middle ages.

"It is evident, that if some well authenticated facts could have been adduced to establish one complete step in the process of transformation, such as the appearance in individuals descending from a common stock, of a sense or organ entirely new, and a complete disappearance of some other enjoyed by their progenitors, that time alone might then be supposed sufficient to bring about any amount of metamorphosis. The gratuitous assumption, therefore, of a point so vital to the theory of transmutation, was unpardonable on the part of its advocate*."

The transmutability of species is a point which has been maintained by many naturalists besides Lamarck, and the reasons they have adduced in support of their opinions are so various, that the full consideration of them would be inconsistent with our present purpose. It may be assumed as capable of most satisfactory proof, that the mutations which species undergo in accommodating themselves to a change of external circumstances, have a definite limit, and are regulated by constant laws; and that the capability of so varying, forms part of the specific character. Indefinite divergence from the original type is guarded against, in the case of intermixture of distinct species, by the sterility of the mule offspring; circumstances which show that

* Principles of Geology, ii. p. 8.

species were designed to retain the individuality of character with which they were endowed at the time of their creation, and that they have a real existence in nature*.

The intellectual faculties of animals, Lamarck regards as entirely the result of organization. Even in the case of the most perfect of them, the human species, there is no distinct recognition of a spiritual substance derived from heaven; and all intellectual phenomena whatever, are ascribed to some physical cause. Nature, he conceives, offers nothing cognizable by us but *body;* the movements, changes, and properties of *bodies*, form the only field open to our observation, and the only source of real knowledge and useful truths†. The place of the soul seems to be usurped by a certain *interior sentiment*, to which he continually refers, as exercising a most powerful influence over all the faculties, and giving rise to all the passions and affections ‡. Thus the noblest faculties of the mind, "the capability and godlike reason," by which we are distinguished from other animals,

> ——— and this spirit,
> This all-pervading, this all-conscious soul,
> This particle of energy divine,
> Which travels nature, flies from star to star,
> And visits gods, and emulates their powers;

* This subject will be found to be discussed at considerable length, and in a very satisfactory manner, in the second volume of Mr. Lyell's Principles of Geology, p. 1—65.

† *Animaux sans Vertébres*, i. p. 260.

‡ *Ibid.* 258, *N. Dict. d'Hist. Nat.* xvi. Art. *Intelligence.*

are made to emanate from a certain relation of parts and organs,—a particular conformation of material substances, just as a desired result is obtained by arranging in a certain order the parts of a piece of mechanism.

"But who can believe that such a faculty, so divine, so godlike and spiritual, can be the mere result of organization? That any juxta-position of *material* molecules, of whatsoever nature, from whatever source derived, in whatever order and forms arranged, and wherever placed, could generate thought, and reflection, and reasoning powers, could acquire and store up ideas and notions, as well concerning metaphysical as physical essences, may as safely be pronounced impossible, as that matter and spirit should be homogeneous. Though the intellectual part acts by the brain and nerves, yet the brain and nerves, however ample, however developed, are not the intellect, nor an intellectual substance, but only its instrument, fitted for the passage of the prime messenger of the soul, its nervous fluid or power to every motive organ. It is a substance calculated to convey instantaneously that subtile agent, by which spirit can act upon body, wherever the soul bids it to go and enables it to act. When death separates the intellectual and the spiritual from the material part, the introduction of a fluid, homogeneous with the nervous, or related to it by a galvanic battery, can put the nerves in action, lift the eyelids, move the limbs; but though the action of the intellectual part may thus be

imitated, in newly deceased persons, still there are no signs of returning intelligence, there is no life, no voluntary action, not a trace of the spiritual agent that has been summoned from its dwelling. Whence it follows, that though the organization is that by which the intellectual and governing power manifests its presence and habitation, still it is evidently something distinct from and independent of it*."

With opinions having such a decided tendency to materialism, it is not surprising that Lamarck seldom makes allusion to a Deity, and when he does so, he nearly confines himself to the bare acknowledgment of his existence. In his earlier works, there is no mention made of a Supreme Being whatever; and even when his existence is admitted, He is divested of the attributes which belong to him. The glory of forming the works of creation, in which His beneficence and power are so signally manifested, is ascribed to *nature*, or a *certain order of things*. This power to which the Deity has delegated his prerogatives, and which he has appointed his vicegerent, Lamarck defines as "An order of things composed of objects independent of matter, which are determined by the observation of bodies, and the whole amount of which constitutes a power, unalterable in its essence, governed in all its acts, and constantly acting upon all the parts of the physical universe†." This blind power, which

* *Kirby's Bridge. Treat. Intro.* p. xxxii.

† N. Dict. d'Hist. Nat. xxii. Art. *Nature*, 377; *Anim. sans Vert.* i. p. 317.

acts necessarily, has not, indeed, called matter into existence, but it has formed all bodies of which matter is essentially the base; and as it exercises no power except on the latter, which it modifies and changes in every possible manner, producing all its various aggregates and combinations, we may be assured that it is it which has made all bodies such as we now behold them, and that it is Nature which confers on some their properties, and on others the faculties which they exercise*. All this power Lamarck distinctly admits has been delegated to Nature by the Deity, and among other errors which he conceives to have attached to the ideas which have been entertained regarding Nature, he refutes the notion that Nature is the Deity himself. "Strange occurrence! that the watch should have been confounded with its maker, the work with its author. Assuredly this idea is illogical and unfit to be maintained. The power which has created Nature, has, without doubt, no limits, cannot be restricted in its will or made subject to others, and is independent of all law. It alone can change Nature and her laws, and even annihilate them; and although we have no positive knowledge of this great object, the idea which we thus form of the Almighty Power, is at least the most suitable for man to entertain of the Divinity, when he can raise his thoughts to the contemplation of him. If Nature were an intelligence, it could exercise volition, and change its laws, or rather there could be

* *Anim. sans Vert.* i. p. 316.

no law. Finally, if *Nature* were GOD, its will would be independent, its acts unconstrained; but this is not the case; it is, on the contrary, continually subject to constant laws, over which it has no power: it hence follows, that although its means are infinitely diversified and inexhaustible, it acts always in the same manner in the same circumstances, without the power of acting otherwise*."

While thus admitting the existence of the Deity, any direct interference in the affairs of the universe is wholly denied to him. His sovereignty is reduced to a mere nominal supremacy, as he is supposed to take no care or thought for the worlds which he authorized or permitted to be created, and can have no sympathy for the creatures which inhabit them. As with La Place, and so many other philosophers of the French school, every thing is ascribed to *secondary causes*, which are made to usurp the place and attributes of the Divinity. Lamarck's deity, therefore, is the exact counterpart of the god of Epicurus, whose being is allowed seemingly more for the purpose of giving consistency to a theory, or a compliance with generally received opinions, than from any urgent conviction of his reality; and we may justly apply to him what was said of the Grecian philosopher; *Re tollit, oratione relinquit Deum.*

It has been already mentioned, that Lamarck's attention was early directed to meteorology, and it seems long to have continued to form one of his

* *Anim. sans Vert.*, vol. i. 322.

most favourite studies. So comparatively limited is our positive knowledge of atmospheric phenomena, that a careful investigation of them afforded the prospect of new and important discoveries; while the endless variety of appearances which they present, and the complicated influences which operate in producing them, offered a wide and interesting field for the exercise of that speculative kind of inquiry which Lamarck loved to indulge. With his usual facility in such matters, he was not long in advancing a theory, according to which the atmosphere is regarded as resembling the sea, having a surface, waves, and storms; it ought, likewise, to have a flux and reflux, for the moon ought to exercise the same influence upon it that it does on the ocean. In the temperate and frigid zones, therefore, the wind, which is only the tide of the atmosphere, must depend greatly on the declination of the moon; it ought to blow towards the pole that is nearest to it, and advancing in that direction only, in order to reach every place, traversing dry countries or extensive seas, it ought then to render the sky serene or stormy. If the influence of the moon on the weather is denied, it is only that it may be referred to its phases; but its position in the ecliptic is regarded as affording probabilities much nearer the truth*.

* On the Influence of the Moon on the Earth's Atmosphere; *Journal de Physique*, Prairial, an. vi. Most of Lamarck's other essays on Meteorology will be found in the periodical just named.

So convinced was Lamarck of the accuracy and value of his theory, that he resolved on reducing it to practice, and thus at the same time establish its truth, and attract the attention of the public towards it. For this purpose he drew up a series of almanacks, which he had the perseverance to publish for ten consecutive years, the nature of which will be best understood from the title of that which first appeared. " Annual Meteorology for the Year VIII of the Republic (1800, A. D.), containing an Exposition of the Probabilities acquired by a long Series of Observations on the State of the Weather, and Variations of the Atmosphere, in different Seasons of the Year; an Indication of the Times when it may be expected to be fine Weather, or Rain, Storms and Tempests, Frosts, &c.: finally, an Enumeration, according to Probabilities, of the Times favourable for Fêtes, Journeys, Voyages, Harvest, and other Undertakings, in which it is of Importance not to be interrupted by the Weather; with simple and concise Directions regarding these new Measures." His predictions, as might have been expected, proved more frequently erroneous than otherwise, but this circumstance was far from inducing him to discontinue his exertions. Every year he had recourse to some new consideration,—such as the phases, the apogee and perigee of the moon, and the relative position of the sun, to account for his previous failure, and afford greater certainty in his future prognostications. After every expedient had been tried without success, he was

at last obliged to renounce the labour as fruitless, satisfied that, however important it would be to foresee the state of the weather, it depends on causes far too remote and complex to be made the subject of calculation.

Speculations of an analogous character regarding the formation of the globe and the changes which it has undergone, were laid before the public, in 1802, in a work entitled "Hydrogeology, or Researches on the Influence exerted by Water on the Surface of the terrestrial Globe," &c. &c. His opinions rest on the assumption that all composite minerals are the remains of living beings. According to him, the seas are continually hollowing out their bed in consequence of being unceasingly agitated by the tides, produced by the action of the moon; in proportion as the bed deepens in the crust of the earth, it necessarily follows that their level lowers, and their surface diminishes; and thus the dry land, formed by the *debris* of living creatures, is more and more disclosed. As the land emerges from the sea, the water from the clouds forms currents upon its surface, by which it is rent and excavated, and divided into valleys and mountains. With the exception of volcanoes, our steepest and most elevated ridges have formerly belonged to plains, even their substance once made a part of the bodies of animals and plants; and it is in consequence of being so long purified from foreign principles that they are reduced to a siliceous nature. But running waters furrow them in all directions, and carry their mate-

rials into the bed of the sea; and the latter, from continual efforts to deepen its bottom, necessarily throws them out on one side or other. Hence there results a general movement and a constant transportation of the ocean, which has perhaps already made several circuits of the globe. This shifting cannot occur without displacing the centre of gravity in the globe; a circumstance which would have the effect of displacing the axis itself, and changing the temperature of the different climates.—In order to silence any doubts that may arise in the minds of his readers from not observing these changes going forward, Lamarck is careful to add, as in the case of the supposed transformation of species, that an unlimited length of time must be allowed for their accomplishment.

But the work on which Lamarck's fame is principally founded, and which has conferred a most important service on zoology, is his *Histoire Naturelle des Animaux sans Vertébres*. From the time of its appearance, this work has ever been regarded as one of the highest authority, and has formed the principal regulator of most departments of this extensive race of animals. The work extends to seven octavo volumes, and is entitled "Natural History of invertebrate Animals, presenting the general and particular Characters of these Animals, their Distribution, Classes, Families, Genera, and the principal Species referable thereto." The first volume is entirely occupied with an introduction, the object of which is to determine the essential cha-

racters of an animal, its distinction from vegetables and other natural bodies, and to explain the fundamental principles of zoology. This introduction may be regarded as furnishing a synoptical view of all the author's peculiar opinions on the origin and developement of living beings, which are illustrated more in detail in separate works. The first five volumes are written entirely by Lamarck, but he was assisted in the part relating to insects by M. Latreille. A portion of the sixth volume and the whole of the seventh, were drawn up by his daughter from his notes and papers, his want of sight preventing him from undertaking that labour himself; and that part of the sixth, which relates to the *mytilacés*, *malliacés*, *pectinides*, and *ostracés*, is written by M. Valenciennes. The first part was published in 1815, and the other parts appeared at intervals up to 1822, when the whole was completed. Besides a luminous and comprehensive account of the general history of the different groups and genera, the principal species are cited and briefly characterized, with their synonymes, reference to figures, and localities. The enumeration of species sometimes includes all the known kinds, and is particularly copious and instructive in relation to sponges and shell-bearing molluscæ. The genera are established with much discrimination, and judiciously characterized by obvious properties, such as form, proportion, nature of the surface, and structure. The synonymy is unravelled with great care, and the descriptions, though necessarily often

very brief, are in general highly satisfactory. These circumstances have rendered this work the most valuable system that has ever appeared of the invertebrate animals; and it has formed the guide to most authors who have since written on the subject*.

The phrase *invertebrate animals* originated with Lamarck, and it expresses, as Cuvier remarks, perhaps the only circumstances in their organization which is common to them all. They were previously known as *white-blooded animals*, a designation which was soon shown to be improper, by the discovery that an entire class (the *annelides*) possesses red blood. The system of Linnæus and Bruguière formed the basis of his course when he first began to lecture on the subject; he subsequently adopted a new classification, founded on their anatomy, which had been published in 1795. This he afterwards modified in various ways, as new discoveries were made, and as new relations suggested themselves to him. In his system of invertebrata, forming an octavo volume, published in 1810, he adopted the class of *crustacea*, and created that of *arachnides*, a step which he judged necessary, in consequence of some new information that had been communicated to him on the heart and pulmonary sacs of spiders. In a previous work he had admitted the *annelides* to the rank of a separate class,

* The most recent and probably the best edition of the *Animaux sans Vertébres*, is in eight volumes octavo, augmented with notes by M. M. Deshages and Milne Edwards.

in consequence of Baron Cuvier's observations on their circulating organs and the colour of their blood, which resembles that of the vertebrate races. Two other classes were created, in his "Philosophical Zoology," viz. the *infusoria* and the *centripedes;* and in this work also he first deviated from the ordinary practice of commencing the arrangement with the most perfectly organized, the inverse order being more in accordance with his theoretical views, which assumed a gradual *progression* in the composition of animal organs, proceeding from the most simple to the most complex.

It was in a small volume, entitled "An Extract from the Zoological Course in the Museum of Natural History, on the invertebrate Animals," &c. published in 1812, that he first presented his general distribution of animals into three grand divisions, *apathetic*, *sentient*, and *intelligent*. This plan he made the foundation of his great work, and the method in which he applied it, as well as his ideas regarding the constitution of the different classes, and their relation to each other, will be understood from the subjoined table.

Invertebrate Animals.

I. Apathetic Animals.
1. *Infusoria.*
2. *Polypes.*
3. *Radiarii.*
4. *Vermes.*
(Epizoaires.)

II. Sentient Animals.
5. *Insecta.*
6. *Arachnides.*
7. *Crustacea.*
8. *Annelides.*
9. *Cirrhipedes.*
10. *Mollusca.*

Vertebrate Animals.

III. Intelligent Animals.
11. *Pisces.*
12. *Reptilia.*
13. *Aves.*
14. *Mammiferæ.*

The animals of the first primary division he defines as destitute of feeling, and moving only by their excited irritability; and he assigns as their character, the absence of a brain and of an elongate medullary mass; senses wanting; forms various; articulations rarely existing. The animals of the second division feel, but they obtain from their sensations only *perceptions* of objects, a kind of simple ideas which they are unable to combine with each other in order to form complex ones. They possess no vertebral column, but have a brain and most frequently an elongate medullary mass; some distinct senses; organs of motion attached under the

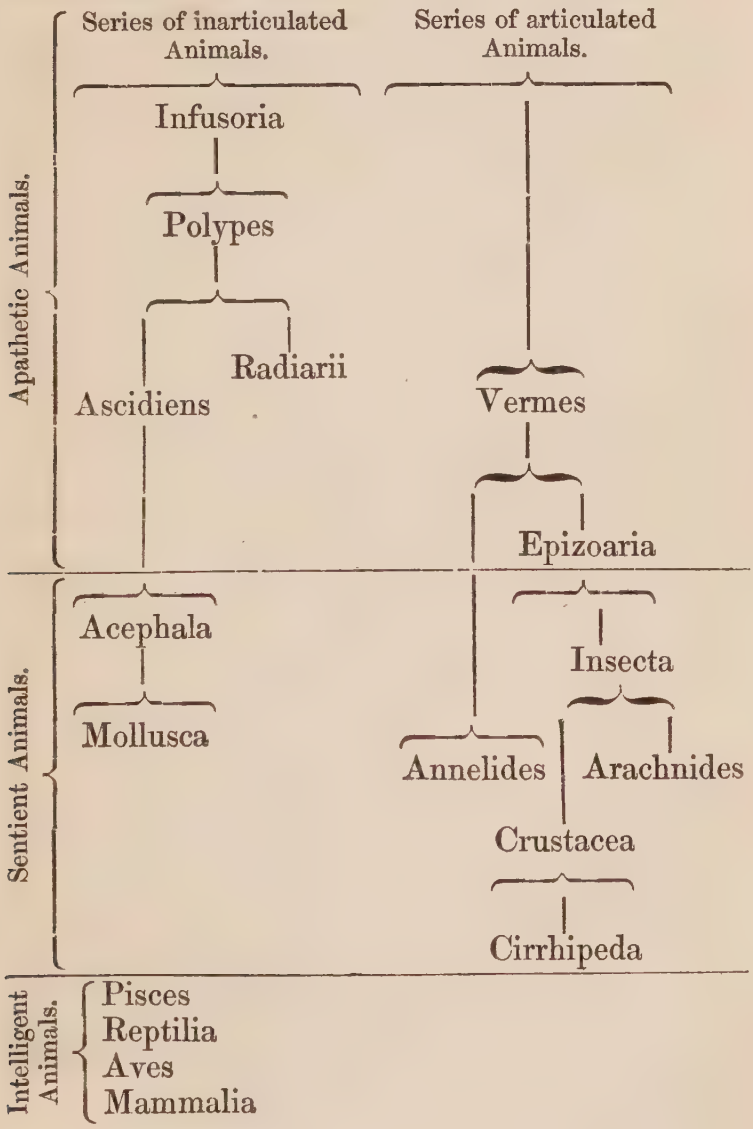
skin; the form symmetrical, the parts arranged in pairs. The *intelligent* animals, forming the third grand division, feel, and acquire ideas capable of being preserved, and execute operations between these ideas which furnish them with others; and they are intelligent in different degrees. They possess a vertebral column, a brain and spinal marrow; distinct senses; organs of motion fixed to an interior skeleton, and symmetrical forms, the parts being placed in pairs*.

This general distribution of animals has not been very much approved of by naturalists; and Cuvier asserts that it is neither founded on their organization, nor an exact observation of their faculties. The degree of intelligence observed in the different classes, would certainly lead most observers to give a very different position to several, from that which they have obtained in the above scale. The *insecta* and *arachnides*, for example, which are made to occupy the lowest place among the sentient races, are undoubtedly entitled to the rank assigned to the *mollusca* and *cirrhipedes;* for there can be no comparison in this respect between a hive-bee or an ant, and an imperfectly organized and almost inanimate mollusc.

At a subsequent period, in consequence of some new discoveries made by M. M. Savigny, Leseur, and Desmarets, he separated certain tribes from the polypi, and formed them into a distinct class under the name of *ascidiens*. Some new views likewise

* *Animaux sans Vertébres*, i. 381.

occurred to him regarding the general arrangement of animals, and instead of presenting them in a simple series, he divided them into two subramose series, as follows:—



This arrangement is particularly deserving of attention, from its being admitted by the author of the circular system to be the first approach to a perception of that order of affinities which he supposes to pervade the whole animal kingdom. "In the first volume of his celebrated work," says Mr. Mac Leay, "Lamarck acknowledges that the idea of a simple series constituting the whole of the animal kingdom does not agree with the evident order of nature, because, to use his own words, this order is far from simple; it is branched, and is at the same time composed of several distinct series. He then presumes, that animals offer two separate subramose series, one commencing with the *infusoria*, and leading by means of the mollusca to the cuttle-fish *(cephalopoda)*, and the other commencing with the intestinal worms, and leading to insects. Now, this notion could only have gained a place in the mind of Lamarck from a conviction by experience of its being an incontrovertible truth. His table of affinities, however confused it may appear, or *subramose*, as it is termed, coincides with the tabular view which I have laid before the public. We have only to join the *radiata* to the *cirripeda*. and the *annelides* to fishes, and Lamarck's table of affinities, with scarcely any alteration, becomes precisely the same as mine*."

In addition to the various branches of natural history already enumerated as cultivated by this indefatigable and ingenious inquirer, another still

* Horæ Entomologicæ, p. 213.

remains to be mentioned, to which he communicated a remarkable impulse; namely, the history of fossil shells. This highly important and interesting subject had long attracted the attention of geologists, but owing to the difficulties with which it is invested, it still remained in comparative obscurity. One of the facts most desirable to be ascertained in relation to these remains, was, whether they were identical with species now living, a point which could be determined only by a careful comparison. Applying to this investigation that profound knowledge which he had acquired of recent shells, Lamarck was enabled to illustrate the subject in a most satisfactory manner, and to throw light on some of the most anomalous phenomena which it presents to the inquirer. Besides his extensive acquaintance with the *testacea*, he enjoyed another advantage for entering upon an inquiry of this nature by residing at Paris, the vicinity of which has long been celebrated for the number and variety of its fossil productions*. The result of his investigation appeared in several of the earlier volumes of the Annals of the Museum; but the memoir was never brought to a conclusion. It was accompanied with a quarto volume of plates, containing figures of great beauty and accuracy.

Such are the principal subjects to which Lamarck's

* Cuvier conceives that the basin of Paris contains a greater accumulation of fossil shells than any other place of equal extent. At Grignon, no fewer than six hundred different species have been collected in a space not exceeding a few square toises.

attention was directed, together with some of the results to which his investigations led him. After his establishment in the Museum of Natural History, much of his time was occupied with the objects whose history he was appointed to teach; and so favourably were his labours in this department received by the public, that his interest as well as his inclination would have conspired to make him cultivate it to the uttermost. But his exertions received an early check, and were at last entirely stopped, by the inroads of a most afflicting calamity. His eyes had long been weak, and as he advanced in years, they became so diseased, that he was obliged to refrain from using them for the examination of any minute object. Hence it was that he had recourse to the celebrated Latreille to assist him in that part of his system of invertebrata which related to insects. Notwithstanding every precaution, the disorder increased, and at last produced total blindness, which continued till his death. "This event was the more distressing," says Cuvier, "because it overtook him in such circumstances that he could obtain none of those means of alleviation which might otherwise have been procured. He had been married four times, and was the father of seven children. The whole of his little patrimony, and even the fruits of his early economy, were lost in one of those hazardous investments which shameless speculators so often hold out as baits to the credulous. His retired life, the consequence of his youthful habits, and attachment to systems so little in accord-

ance with the ideas which prevailed in science, were not calculated to recommend him to those who had the power of dispensing favours. When numberless infirmities, brought on by old age, had increased his wants, nearly his whole means of support consisted of a small income derived from his chair. The friends of science, attracted by the high reputation which his botanical and zoological works had conferred on him, witnessed this with surprise. It appeared to them, that a government which protects the sciences, ought to have provided for the wants of a celebrated individual; but their esteem for him was doubled, when they saw the fortitude with which the illustrious old man bore up against the assaults both of fortune and of nature. They particularly admired the devotedness which he inspired in such of his children as remained with him. His eldest daughter, entirely devoted to the duties of filial affection for many years, never left him for an instant, readily engaged in every study which might supply his want of sight, wrote to his dictation a portion of his last works, and accompanied and supported him as long as he was able to take some exercise. Her sacrifices, indeed, were carried to a degree which it is impossible to express; when the father could no longer leave his room, the daughter never left the house. When she afterwards did so, for the first time, she was incommoded by the free air, the use of which had been so long unfamiliar to her. It is rare to see virtue carried to such a degree, and it is not less so to inspire it to that

degree; and it is adding to the praise of M. de Lamarck, to recount what his children did for him."

After several years of affliction, his constitution at last gave way, and he died on the 18th December, 1829, in the 85th year of his age. Some of his children had been carried off previously, and at the time of his disease only two sons and two daughters survived. The eldest of the former was appointed to a situation of considerable trust under government.

A just estimate of Lamarck's merits, will entitle him to occupy a high place among modern naturalists. Endowed by nature with varied and vigorous mental powers, he was fitted to excel in many branches of knowledge, and never failed to strike out a new path in every department to which he attached himself. He possessed, in an eminent degree, some intellectual qualities which are not frequently combined; a lofty and active imagination, in no way unfitted him for the most unwearied and laborious investigation of minute matters of fact. Hence he seems equally following the natural bent of his mind, when devising a theory to explain the most recondite operations of nature, and describing the markings of a shell, or the ramifications of a coral. It is to be lamented that his imagination so often gained the ascendency over his other faculties, and led to those daring and licentious speculations which have been alluded to. But in other instances, his fancy becomes the legitimate handmaid of his reason, and lends her aid in beautifying and illustrating his

speculations. He possessed especially all the requisite qualifications for a zoologist, and it is on what he accomplished in this department that his fame must principally rest. When we perceive the admirable manner in which he discerned and characterized natural groups, his skill in seizing on the most distinctive marks of species, the indefatigable industry with which he investigated their history and synonymy, together with the excellence of his system of arrangement,—we are led to regret that he was so late in entering upon this field of labour, as to be obliged to confine his attention to one division of the animal kingdom, and that he so frequently deviated even from that, in order to indulge his favourite practice of theorizing.

However little value may now be attached to these theories, without a due consideration of them, we can neither appreciate some of the best of Lamarck's writings, nor understand the character of the man himself. In his own eyes, they appeared of paramount importance. The most practically useful of his zoological and botanical works he regarded as trivial in comparison. He conceived them to present a key to some of the most secret operations of nature, and to afford the means of placing many branches of knowledge on a new foundation. This ardent attachment to views which have so generally been considered extravagant and untenable, may seem surprising in the case of an individual whom all must acknowledge to be possessed of much acuteness and discrimination. It is perhaps

to be accounted for by their being nursed in the long solitudes to which his bad health and limited circumstances frequently confined him, without having his eyes opened to their fallacies by a discussion of their merits, or interchange of thought with others: for

> 'Tis thought's exchange, which, like the alternate rush
> Of waves conflicting, breaks the learned scum,
> And defecates the student's standing pool;
> By that untutor'd, contemplation raves,
> And nature's fool by wisdom is outdone.

It may likewise be supposed that he would be unwilling to perceive, or if he did perceive, equally reluctant to acknowledge, the imperfection of systems which he had wrought out with so much care and labour. For that they must have cost him a great degree of laborious thought, will appear from the slightest inspection. It must also be allowed, that they evince a reach of mind, a power of original thinking, and a degree of varied knowledge, calculated to convey no mean idea of his intellectual character. Neither can we deny to them a certain degree of consistency, or adaptation of parts to each other; and although the praise of consistency must be qualified by the admission that it is consistency in error, yet, in such cases, this is of such difficult attainment, as of itself to imply a high degree of acuteness and circumspection. However startling the conclusions to which Lamarck leads us, they are generally drawn by a legitimate and fairly managed process of induction from the assumed

premises. But the very extravagance of the conclusions ought to have created a suspicion that the premises were erroneous; and they are, in fact, almost invariably found to be wholly inadmissible.

While, therefore, we acknowledge Lamarck's pre-eminent excellence in the ordinary subjects of natural history, we cannot fail to lament that his attention was so often engrossed by fanciful speculations; speculations of which, all things considered, it is no undue depreciation to affirm that they are at once absurd and impious—alike opposed to reason and religion; and the regret which must be felt in making such an assertion in regard to so celebrated a man, is not a little enhanced by the accompanying reflection, that, with Lamarck and others of his school, the latter imputation would be regarded as infinitely less discreditable than the former.

INTRODUCTION.

But O ! what terms expressive may relate
The change, the splendour of their new-formed state !
Their texture, nor composed of filmy skin,
Of cumbrous flesh without, or bone within,
But something than corporeal more refined,
And agile as their blithe informing mind.
In every eye ten thousand brilliants blaze,
And living pearls the vast horizon gaze ;
Gemmed o'er their heads the mines of India gleam,
And heaven's own wardrobe has arrayed their frame :
Each spangled back bright sprinkled specks adorn,
Each plume imbibes the rosy tinctured morn,
Spread on each wing the florid seasons glow,
Shaded and verged with the celestial bow :
Where colours blend an ever varying dye,
And wanton in their gay exchanges vie.

BROOKE.

HAVING already discussed the general history of butterflies at considerable length, in a volume devoted to the illustration of the kinds found in Britain, it is not our intention to resume the subject in this place, further than to make a few remarks on certain peculiarities presented by many foreign species, a selection from which forms the subject of the present volume.

The remarkable superiority in size and beauty of most tropical productions over those of temperate regions, is scarcely more strikingly exemplified in any department of nature than in this. The most richly ornamented of our native species, and we possess many of great beauty, appear insignificant when contrasted with those of Brazil and Eastern Asia. Various as are the modifications of form which they present in this country, we find nothing to prepare us for the peculiar outline and aspect which many kinds assume in the warmer regions of the earth. Here we seldom find any having the hinder wings prolonged into a tail, but among foreign species this is a common appendage, sometimes long and linear, at other times broad and spatulate; and occasionally there are not fewer than three or four on each of the hinder wings. Along with this variety of outline, they exhibit almost every possible shade of colour, from the most brilliant to the most obscure, combined and blended in the most elegant and harmonious designs, rendering this tribe of creatures one of the most ornamental to be found in nature.

Although such endless diversity of colouring is observable in this class as a whole, it is, at the same time, worthy of remark, that most of the principal groups are characterized by the prevalence of particular hues, as well as considerable uniformity in their mode of distribution; that is to say, certain modifications of structure are generally accompanied with a certain pictorial design. Thus, the greater proportion

of the genus *Pieris* are white; *Colias* and *Callidryas* various shades of yellow, from the palest sulphur-yellow to deep reddish-ochre. *Argynnis* is almost invariably fulvous or reddish brown, variegated with numerous undulating black lines or spots; the under side more or less ornamented with silvery streaks and spots. In the species of the European genus *Thais*, the wings are spotted or chequered with black and red. The prevailing colour in the genus *Argus* is azure-blue. *Danais*, *Idœa*, and *Euplœa*, have this character in common, that the breast and head are always punctured with white. In *Cethosia*, hieroglyphical markings cover the under side of the wings in such a manner as is observable in no other genus.

Many of the caterpillars of exotic butterflies offer peculiarities in their forms and appendages, of which we find no prototype in the kinds occurring in Britain. In the place of spines, some have the body thickly covered with long fleshy prominences, of a corneous consistency at the tip, and probably serving as a means of defence. In others, spines of singular conformation and formidable size are thickly stuck over the whole surface, making it resemble a miniature forest. A few are provided with a long anal horn, resembling that which is so conspicuous in the caterpillars of the Sphinges. If Madam Merian's delineation of the larva of *Urania Leilus* be correct (which there is now reason to believe is the case), it bears many slender spines, as long as the whole body, and as stiff as iron wire. Another

species (that of *Papilio Protesilaus*), is likewise clothed with plumose spines, two of which at the hinder extremity are much longer than the rest, and terminate in an appendage like a star. Equally remarkable with any of these is the caterpillar of one of the Nymphalidæ (*Adoleas Aconthea*), which has a series of long filiform bodies projecting from each side, thickly clothed laterally with hairs of considerable length diminishing gradually to the extremity, which is armed with a few minute spines.

As might be expected, great diversity likewise prevails in the appearance of the chrysalides; but to these it will be more convenient hereafter to refer, in the preliminary notices to the respective genera. One of the most remarkable, however, may be mentioned, that of *Morpho Menelaus*, which has the nasal prominence of the prothorax produced into a long curved horn, which extends to the middle of the abdomen. In another species of the same group, the head is obtuse, projects considerably, and is curved upwards at the extremity, exactly like the beak of an ancient galley.

Our acquaintance with the geographical distribution of the diurnal lepidoptera was long very imperfect, and it may yet be said to be very far from complete. The older naturalists seem to have been but little alive to the importance of the subject, and even if it had been otherwise, the means they possessed for illustrating it were comparatively limited. Those who had opportunities of collecting specimens in foreign countries, valued them merely as

specimens, and, in general, kept no record of their localities, or natural history properly so called. Collections from China and the East Indies were indiscriminately mixed, in their way homewards, with others from the Cape of Good Hope; and American species were in like manner mingled with such as are proper to the West Indian islands. Hence it followed, that Fabricius and others were so often led into error when they indicated the native country of the kinds they described: but, indeed, the author just named did not very frequently attempt this, but merely says, "From the Indies"—an expression which means nothing more explicit, in his acceptation of it, than that the species in question is exotic. Linnæus, also, when he uses the same word, means indiscriminately either the East or West Indies. The indications of localities in modern works are in general copious and accurate, but they have not hitherto been made the basis of any general and satisfactory view of the distribution of the species.

As might be expected in the case of animals endowed with considerable power of flight, certain kinds of diurnal lepidoptera have a much more extensive range than most other insects—than the coleoptera for example. It is now ascertained that *Cynthia cardui*, a species well known throughout Europe, (without confounding it, as may sometimes have been done, with the kindred species *C. Hunteri*), occurs in Senegal, Egypt, Barbary, Cape of Good Hope, in the islands of Bourbon and Mada-

gascar, in Bengal, China, Java, New Holland, Brazil, and North America; so that it may be called a complete cosmopolite. Of the four quarters of the globe, Europe is poorest in these insects; and next to it is Africa. Asia, including the great islands of the Indian Archipelago and America, are both exceedingly rich. Of the former, the islands seem to be much more prolific than the continent; they are the exclusive haunts of the gigantic *Ornithoptera*, several of the largest and most richly coloured of the *Pierides*, as well as several of the most remarkable species of the genus *Morpho*. South America produces a greater number than any other country; and Brazil, always preeminent for its exuberance both in animal and vegetable life, may be said to be the richest portion of the new continent. It has been estimated by an individual who has enjoyed the advantage of personally examining the country, that Brazil alone affords between 600 and 700 species of diurnal lepidoptera, a calculation which seems in no degree overcharged. Among these are many genera peculiar to America, such as *Heliconia*, *Castnia*, *Erycina*, &c. In almost every one of its physical properties, Africa affords a complete contrast to the country just named; and however favourable its arid soil, and far-extending desarts of parched and drifting sand, may be to the existence of certain peculiar races of coleoptera, it is by no means generally adapted to the support of creatures which derive their entire sustenance from vegetable juices. The sea-coast, and umbrageous banks of the larger

rivers, however, are pretty abundantly supplied, and afford many species peculiar to the country. This is the metropolitan station of the genus *Acrea*, and it is likewise inhabited by several peculiar groups of the genera *Papilio*, *Pieris*, &c. The neighbouring island of Madagascar is much richer than the continent, and exemplifies what has been observed in relation to many other islands, that their zoological productions by no means correspond to those of the nearest portion of the main land. Little relation exists between the diurnal lepidoptera of Madagascar and the Cape of Good Hope, but a very close one can be traced between the former and those inhabiting distant parts of the continent, such as Senegal and Sierra Leone. Mauritius and Bourbon likewise differ considerably in their lepidopterous productions from Madagascar. In the latter, magnificent *Papilios*, *Acrææ*, *Euplææ*, *Danaides*, *Uraniæ*, *Cyrestes*, *and Xanthidia*, embellish by their elegant forms and splendid colours, the marshy and pestilential forests of that extensive island, and rival in beauty that majestic and teeming vegetation which has always excited the admiration of botanists*. New Holland is not without its peculiar species, although this department of its zoology is not characterised by such marked singularities as are observed among its higher animals and vegetable productions.

A singular circumstance has been recorded by a

* See Boisduval, Nouv. Ann. du Museum, vol. ii.

recent traveller regarding one of the species, *Euplœa humata* (Mac Leay), found in the country just referred to, namely, that it is employed as an article of food!

He states that there is a certain mountain, called the Bugong Mountain from multitudes of small moths, named Bugong by the natives, which congregate at certain times upon the masses of granite which compose it. The months of November, December, and January are quite a season of festivity among these people, who assemble from every quarter to collect these moths. They are stated also to form the principal summer food of those who inhabit to the south of the Snow Mountains. To collect these moths (improperly so called, for as above indicated, they are true butterflies), the natives make smothered fires under the rocks on which they congregate; and suffocating them with smoke, collect them by bushels, and then bake them by placing them on heated ground. Thus they separate from them the down and the wings; they are then grounded and formed into cakes, resembling lumps of fat, and often smoked, which preserves them for some time. When accustomed to this diet, they thrive and fatten exceedingly upon it*. Millions of these butterflies were likewise observed on the coasts of New Holland, both by Captains Cook and King; and thus, says Mr. Kirby, has a kind Providence provided an abundant supply of food for a

* Benett's Wanderings, &c. i. p. 265.

race that, subsisting entirely on hunting and fishing, must often be reduced to great straits*.

These insects were, no doubt, the first that attracted the attention of naturalists, in consequence of their imposing appearance and striking metamorphoses. Collections of them began to be made at an early time, and were valued not only by the lover of nature, but by those who had no farther or more worthy design in view than to possess them as objects highly ornamental. Very extensive collections exist in nearly all the principal cities and museums of Europe; and many are to be found throughout Britain, not only belonging to public institutions for promoting natural history, but also in the possession of private individuals. One of the best conditioned collections of exotic lepidoptera in this country, is that in the possession of the East India Company, made in Java by Dr. Horsfield. As the method followed by that gentleman for preserving his specimens was attended with great success, the following account of it will be interesting and useful to those who have opportunities of making collections in foreign countries:—"During the inquiries I made," says Dr. Horsfield, "in the early part of my residence in Java, to become acquainted with the best methods for securing what I obtained in my excursions, I noticed the plan described by Le Vaillant in his Travels in Africa, for the preservation of entomological collections. It is the following:—Boxes or chests carefully made of light

* Bridg. Treat. ii. 350.

wood, of a convenient portable size, are provided with partitions or moveable shelves, each consisting of a simple board; these are fitted at the distance of two inches one from another, in grooves in the sides of the box, in which they are made to slide with accuracy and facility, and are therefore removable at pleasure. These boards or shelves have necessarily the exact dimensions of the ends of the chest, and are placed in a vertical position; a small vacancy is preserved between this lower extremity and the floor, and any object detached by accident falls to the bottom without causing further injury. Each board or shelf, lined with cork or soft wood, supplies, in some measure, the place of a cabinet drawer. When taken out of the box and placed on a table, it rests securely, and affords a plain surface, upon which insects may be fixed and examined with perfect ease and security: it is returned into the box in an instant, which, if carefully made, when closed secures most effectually the contents. A small quantity of camphor, at the bottom, spreads its influence over the whole. One large box may conveniently contain fourteen boards, answering the purpose of as many drawers; and, being eighteen inches long, they have a manageable size. This plan I resolved to adopt. In the early period of my pursuits, the boxes which I provided were made of light wood, and to their use I must ascribe, in a great measure, the preservation of my collection. I found that they afforded a complete protection against the ants and other destructive insects which

abound in the island of Java, perhaps as much as in any other tropical region. They were peculiarly useful in travelling, and possessed the advantage of affording a ready access to the subjects. As the ultimate object of my pursuits was to provide an extensive and well-conditioned collection, which might be useful and instructive in England, I had, soon after receiving the patronage of the Honourable East India Company, directed my attention to the provision necessary for its safety during a voyage. My residence at Surakarta afforded me peculiar advantages in this point of view. Both materials and workmen are here obtained, perhaps more readily than in any other part of Java. Boxes, according to the plan described, were therefore provided, of more substantial materials than those employed in travelling, in proportion to the increase of the collection. The wood of the *Bombax pentandrum* was employed for lining the boards and securing the pins; and I ascribe to an acquaintance with the peculiar property of this wood—which renders it an effectual substitute for cork—the preservation of the collection during its transportation. After having carefully packed the subjects, every necessary precaution that suggested itself was used in securing the boxes against accidents during the voyage. They were individually painted and covered with oil-cloth. Each box was then placed in an outer case, made of the same substantial materials, and secured in the same manner. By these various precautions, and by the care which the collection

received from the commander of the vessel during the voyage, I enjoy the satisfaction of having brought the whole in safety to England*."

The systematic arrangement of this tribe of insects has always been considered a task of great difficulty. So convinced of this was Latreille, who had himself studied the subject profoundly, that he says a classification of lepidoptera may be considered the touchstone of entomologists. This difficulty arises chiefly from the uniformity of organization which prevails throughout the order—a uniformity occasioned by all of them being designed to subsist on liquid food, and to imbibe it in the same manner. The oral organs, therefore, which are of the first importance in classifying other tribes—the coleoptera, for example, in which they undergo almost endless variations of form and consistency to fit them for consuming every kind of organic substance, from semi-fluid animal or vegetable matter to the hardest ligneous tissue—are, in this instance, of comparatively little avail. Recourse must be had to secondary and subordinate characters; and even when we are convinced that, owing to a peculiar *facies*, and the concurrence of many minute resemblances, certain groups should be regarded as distinct, it is found difficult to define them in a satisfactory manner. Neither has the difficulty been much lessened by the manner in which the subject

* Horsfield's Catal. of the Lepidopterous Insects of Java, Intro. p. 9.

has been handled by many modern naturalists. The numerous illustrations of lepidoptera published of late years, have been *partial*, being either selections from the whole class, or forming part of a local fauna. In either case, the subject is regarded in too insulated a light. The illustrator of foreign butterflies selects a species, and by giving prominence to all its minute characters, proposes it with considerable plausibility as a distinct genus. The local faunist divides his groups in reference to his own limited sphere of observation. Neither contemplates the possibility of being ever called upon to elaborate a general system, and he leaves it to those who are to reconcile all existing inconsistences. Hence it follows, that so many of the genera proposed in local and partial works can find no place in a general one; for however specious they may appear when standing alone, it is often found that they will not unite into a consistent whole, and they may therefore be said still further to embroil the very subject they were designed to elucidate.

The Linnean distribution was vague and unsatisfactory, even at the time when it was first produced, and soon became utterly inapplicable when the amount of known species was increased. But it did not fail to exercise, like every other system emanating from that gifted mind, a powerful influence on the progress of the science, and is interesting on account of its ingenuity and poetical elegance.

" It is an attempt," says Dr. Shaw, " to combine, in some degree, natural and civil history, by attaching the memory of some illustrious ancient name to an insect of a particular cast." The first Linnæan division consists of *Equites*, which are distinguished by the shape of the upper wings; these are longer, measured from their posterior angle to their anterior extremity, than from the same point to the base; the antennæ sometimes filiform. The *equites* are denominated *Troes* or Trojans, distinguished by having blood-coloured spots on each side of the breast: or *Achivi*, Greeks, which are without red marks on the breast, of gayer colours, and having an eye-shaped spot on the anal angle of the inferior wings. The second division consists of *Heliconii*, which are distinguished by having the wings narrow and entire, often naked or without scales; the superior oblong, the inferior very short. The third division consists of the *Danai*, so called from the sons and daughters of Danaus. They are divided into *Danai candidi*, or such as have whitish wings, and *Danai festivi*, in which the ground colour is never white, and the surface variegated. The fourth division consists of the *Nymphales*, distinguished by the edges of the wings being scolloped or indented; it is subdivided into *N. gemmati*, in which the wings are marked with ocellated spots, and *N. Phalerati*, without these spots. The fifth division contains the *Plebeii*. These are commonly smaller than the preceding butterflies, and are subdivided into *ru-*

rales and *urbicolæ*; the former having the wings marked with obscure spots, the latter for the most part with transparent spots.

In his earlier works, *Mantissa* and *Species*, Fabricius made no important change on the Linnæan method; but the many additional species which had come to his knowledge when he drew up his *Systema glossatarum*, led him to establish many new genera, and remodel the arrangement of the old ones. This method consists of forty-one genera, most of which have been adopted by subsequent authors; but it is less complete than it might otherwise have been rendered, owing to the death of the author before it was finished. Latreille did not deviate materially from the Fabrician method, adopting nearly all the genera; but he did not derive the distinctive characters exclusively from the antennæ and palpi, as the Danish entomologist had done, but had recourse to other parts of structure, and likewise judiciously took into account the peculiarities of the caterpillar and chrysalis. Several arrangements were proposed subsequent to or contemporaneous with that of Latreille, such as those of Lamarck, Dumeril, Dalman, &c. but most of them are of little importance. The last mentioned individual, however, appears to have been the first to apply to actual practice, in his description of the lepidoptera of Sweden, characters derived from the neuration of the wings, the value of which were first pointed out by Mr. Jones, in a paper in the Linnæan Transactions, published in 1794. Godart.

without appearing to have been acquainted with what had been done by Dalman, likewise had recourse to the structure of the wings in his arrangement, as published in the Encyclopedie Methodique, and Lepidoptera of France. In the latter work, the diurnal series is classified with reference to the appearance of the discoidal cell in the inferior wings; and by adopting this excellent character, he has, in most instances, greatly improved on Latreille's method.

In 1776, an arrangement was proposed which attracted little attention at the time, but which has since risen to considerable distinction. It is that exhibited in the Systematic Catalogue of the Lepidoptera found in the neighbourhood of Vienna, by MM. Denis and Schiffermüller. This original and highly valuable system is entirely founded on the appearance of the caterpillars. It is singular that characters almost exclusively drawn from that state, should confirm the classifications founded on characters afforded by the imago or complete insect. But to such a degree does this coincidence obtain, that almost all the families proposed by the Austrian naturalists have been adopted as genera by those who were guided by other principles. This method remained for a long time almost unknown to the naturalists of this country, and even on the continent its excellence seems to have been but inadequately appreciated, except among the Germans. The only authors that have acted upon it are Ochsenheimer, and his continuator

Treitschke, in their valuable and extensive work on the Lepidoptera of Europe*.

But there can be little doubt that those arrangements are the most accurate and philosophical which are founded on characters derived from all the different states in which these insects exist. This conviction seems now to be generally entertained, and most writers of very recent date have seen the propriety of acting upon it. In the works of Curtis, Stephens, Horsfield, &c. it has been adhered to to a greater or less extent, and in a general work on Lepidoptera lately published by Dr. Boisduval of Paris, nearly equal importance is assigned to the peculiarities of the caterpillar, chrysalis, and butterfly. As this method presents some new features, and is the last that has been laid before the public, we shall give an account of it along with the accompanying remarks in the author's own words:— "It is not till after a most attentive study of the butterflies of Europe in their different states, and after having collected a certain number of materials on the metamorphoses of exotic species, that we have attempted to group the lepidoptera in a manner different from that hitherto followed, not neglecting, at the same time, the study of those authors who have occupied themselves with this order, that we might be enabled to combine the results of their labours with our own. We do not flatter our-

* This work extends to fourteen volumes (the last published in 1833), and three supplementary ones are in course of preparation.

selves, however, that the combinations which we have made are altogether free from blame, any more than those of our predecessors. When occupied with the productions of a single country, the classification is much more easy; the greater number of species associate pretty well with each other, and, if we except a few of the most anomalous, a series is obtained free from much irregularity. In this way, the European species form a pretty homogeneous assemblage, and the same thing holds with regard to those of South America, New Holland, or any other country taken by itself; but when we attempt to classify those of the whole globe, we frequently meet with intermediate genera which interrupt this harmony. If we even take a somewhat numerous genus belonging at the same time to several different countries, we find species which form a passage to other races proper to each of these countries. For example, the genus *Pieris* of Latreille offers species in America (genus *Leptalis)* which bear a perfect resemblance to the *Heliconii* in their colour, the length of their bodies, and narrowness of the wings. Others of the same country (genus *Euterpe)* insensibly unite with that division of American *Papiliones* which is of a black colour with red spots; those of Europe, on the contrary, present certain relations to *Parnassius*, *Pieris Crataegi* appearing to form the passage to *P. Mnemosyne*, while those of India gradually approach *Colias* through *P. Judith* and *P. Panda*, and to *Danais* with green spots through *P. Valeria.* All other

genera of some extent, and distributed over several countries, are in the same condition.

"What we have just stated, applies equally to the correlation of species with each other. If we take, for example, the genus *Satyrus* of Latreille, we perceive that it is composed of an infinite number of secondary groups, scarcely any of which are proper to one country. Thus, in Europe, we have the division to which *Galatea* belongs, extending along the basin of the Mediterranean, even into Persia; that of *Hermione*, which takes the same direction, and continues to Cachmere; that of *Norna*, proper to the polar regions of the two continents; that of *Nigres*, which inhabits mountainous countries, and is found only at the Cape and at Chili; finally, that of the *Satyres*, properly so called, which are connected with the species of New Holland, some of them with those of Chili, of North America, and Siberia. America and the East Indies, likewise, present groups which in general appearance differ widely from our European species; while there are others which resemble several at the same time. A collection of the *Satyres* of one country would, therefore, form a sufficiently natural series; but it would appear most irregular when the species of several countries were brought together.

"Our method is partly founded on the caterpillar, and partly on the perfect insect. We attach the greatest importance to the caterpillar state, and the characters which it furnishes have often more value

in our estimation, than those afforded by the butterfly; but generally these characters confirm each other, in other words, two caterpillars presenting the same characters produce flies which likewise partake of the same generic characters. It will no doubt be objected to us, that it is illogical to deduce characters except from the animals we are attempting to classify. We reply, that by following any other plan we must despair of attaining to a natural method. Besides, it is not necessary to be acquainted with the caterpillars of every species; it is sufficient to study a caterpillar and chrysalis of *Vanessa* or *Pieris* to have an exact idea of those of the two genera. Even though it should be very difficult to verify the characters taken from the larva, this is no reason why we should abstain from employing them. It is not merely from the fruit that botanists obtain their characters, but likewise from the flower, and even from the first developement of the vegetable embryo. The flower is to the plant what the caterpillar is to the lepidopteron, and the different modes of metamorphosis have as much value as those of inflorescence.

" It appears to us that Latreille's three divisions, taken from Linnæus—*Diurnal*, *Crepuscular*, and *Nocturnal*—are too inaccurate to be retained, especially the crepuscular section. The denomination *Diurnal* not only applies to all the known kinds of day butterflies, but also to an almost infinite number of others forming a part of the two other divisions, such as *Macroglossa*, *Zygenides*, *Castniariæ*,

Ægocerides, &c. That of *Crepuscular* is adapted more or less to some sphinges, but by no means to the *Zygenides*, which fly only in the heat of the sun. Finally, the term *Nocturnal* is not more properly applicable to all the species, since many belonging to this section appear only during the day. In order to avoid these improper denominations, we have substituted for the word *Diurnal*, that of *Rhopaloceres*, proposed by M. Dumeril. Being unable to perceive limits between the *Crepuscular* and *Nocturnal* divisions of Latreille, we have united those two great sections under the name of *Heteroceres*. In our method, therefore, the lepidoptera are divided into two grand legions, *Rhopaloceres* and *Heteroceres**."

Dr. Boisduval then proceeds to explain that the first of these divisions is characterised by antennæ thickening to a club at the extremity; and the second, by having these organs variously shaped; this indeed is implied by the words themselves. The first division is subdivided into three sections, according to the manner in which the caterpillars transform themselves into chrysalides. Such as undergo this change by attaching themselves by the tail and a band round the middle, form the first division, named *Succincti*; such as are suspended by the tail only, the second, *Penduli*; while those which form a cocoon by rolling leaves together, compose the third division, termed *Involuti*.

* Species général des Lepidoptères, p. 158.

Each of these three sections is then divided into *tribes*, according to characters derived from the caterpillars and the perfect insect. Among those furnished by the latter, the most important are considered to be the number of ambulatory legs and the form of the palpi. The genera are characterised by the form of the caterpillar and chrysalis, by the dispositions of the nervures of the wings, the form of the antennæ, legs, palpi, thorax, &c. of the perfect insect.

Genus ORNITHOPTERA.

The present generic group was first separated from *Papilio* by Dr. Boisduval. None of its characters, taken singly, are very strongly marked, but their aggregate importance is sufficiently considerable to authorise its adoption. As in *Papilio* the antennæ form an elongate club, having the extremity slightly curved upwards, the palpi are longer than in the genus just named, but they never rise above the forehead. The prothorax is much developed anteriorly, and forms a pretty distinct neck. The abdomen is long and robust, that of the male deeply grooved on the under side, and provided at the anal extremity with two large rounded valves. The wings are large, of a strong texture, and furnished with salient nervures; the anterior pair elongate; the posterior with wide shallow indentations, and never prolonged into a tail.

We are very imperfectly acquainted with the natural history of the insects of this group in their early stages. Their remote localities, and the rarity of most of the species, have, for the most part, prevented them from falling under the notice of competent observers. The caterpillar and metamorphoses of one of them (*O. Heliacon*), however, have been described by Dr. Horsfield. Like the

caterpillars of *Papilio*, it is furnished with two retractile tentacula; the body is large and thick, and bears eight rows of rather long fleshy prominences, of a conical shape. The chrysalis into which it is transformed is somewhat curved, having the head obtuse, and a few projecting points above the middle. It is suspended by the tail, and a transverse band, which, however, does not encompass the body, but is inserted on each side. (See Fig.)



This group is but of limited extent, but it comprehends some of the largest and most beautiful lepidoptera yet known to us. With one exception, which extends over a portion of the Indian continent, they are confined to the Mollucca, Philippine, and others of the numerous and extensive islands of the Indian Archipelago. The species figured, which is the most beautiful of the whole, and to which Linnæus applies the epithet of *august*, has been long known and highly prized by collectors. It is named



1. Ornithoptera Priamus.



2

Lizars sc.

2. *Ornithoptera Remus.*

boina.

ORNITHOPTERA PRIAMUS.

PLATE I. Fig. 1.

Boisd. Species gener. des Lepidop., 173.—Papilio Priamus, *Linn. Latr. Godart, Cramer; Papillons exotiques*, 23, A, B; *Donovan's Insects of India*, Pl. 3.

Female, Pap. Panthous, *Linn.; Cramer*, 123, A, and 124, A; *Don. Ins. of India*, Pl. 2.

Such a remarkable discrepancy exists in the appearance of the sexes, that they were always regarded as separate species till lately, when their proper relationship to each other happened to be ascertained. The anterior wings of the male are deep velvety black, with two broad longitudinal stripes of rich silky green, curved, and narrowing at both extremities; between these stripes there is a large brownish spot disposed longitudinally. The hinder wings are silky green, with the posterior margin, and a series of four pretty large circular spots, velvet-black; between the black spots and posterior border are two orange spots, and another of larger size towards the base of the wing. On the under side, the anterior wings have a macular band of gilded green, formed of contiguous wedge-shaped spots, an irregular patch towards the centre, and two streaks near the apex. The under side of the

hinder wings corresponds to the surface, but the green is of a more golden hue, and the circular spots larger, and seven in number. The antennæ, head, and thorax, black—the latter with a central line and two posterior spots of golden green; breast spotted with red on the sides; abdomen bright yellow.

The female is considerably larger, frequently measuring nearly eight inches between the tips of the wings. The prevailing colour is dark brown, deepening towards the extremities of the wings; the upper pair traversed by a macular band of impure white, the spots unequal and generally interrupted or notched; the hinder pair having a curved row of six large wedge-shaped spots behind, of a whitish colour powdered with black, the base tinged with yellow, and each with an orbicular black spot in the centre. Head and thorax entirely black, the abdomen whitish yellow above and deep yellow beneath.

Varieties of both sexes have occurred, for there seems little reason to doubt that the insect figured by Guerin (*Voyage de la Coquille, Ins.*, pl. 13, fig. 1 and 2) under the name of *P. urvillianus*, is a variety of the male, while a female variety is described by Boisduval*. In the former, the green of the superior wings is replaced by violet-blue of a very brilliant tint, and in the hinder part that colour runs in a broad stripe along the nervures, dilating

* *Voyage de l'Astrolabe, Ent.*, pl. 4, fig. 1 and 2.

considerably towards the posterior margin. This example was found at Offack.

The Priam butterfly is found in the islands of Amboina, Rawack, and Ceram. It has been observed to hover about the *Mangifera Indica* in preference to other trees, and it has hence been conjectured that it deposits its eggs on the leaves, and that they constitute the food of the caterpillar. It never occurs in large numbers, and is hence somewhat rare in collections. Specimens of both sexes are preserved in the valuable collection of insects belonging to the Edinburgh University Museum.

ORNITHOPTERA REMUS.

PLATE I. Fig. 2.

Pap. Remus, *Fabr. Godart*, *Cramer*, 135, A, 136, A, and 386, A, B.—Pap. hypolithus, var. *Cramer*, 10, A, B, 11, A, B.

One of the largest species, the expansion of the wings sometimes measuring nearly eight inches. The superior pair are black, with a slight greenish reflection, and having a broad greyish-white stripe running along each side of the secondary nervures. The inferior wings are dark grey on the surface, and of a shining white on the under side, the latter having a black sinuated border interrupted by seven irregular spots of golden-yellow diminishing in size as they approach the abdominal margin. In the female, which is the sex represented on the adjoining plate, the golden-yellow spots are much larger, somewhat wedge-shaped, and each of them, except the outermost, marked with a large oval black spot. The abdomen is bright yellow above, paler on the under side, and irregularly spotted with black; the head, thorax, breast, and antennæ entirely of the latter colour.

The native country of this elegant species is the island of Amboina.

Genus PAPILIO.

Passing from the Ornithoptera, which may be esteemed the chiefs and princes of their race, we now come to the Papilios, properly so called, some of which are scarcely inferior in their dimensions and imposing aspect. Such, at least, is the case with *P. Antimachus* and *P. Antenor*, which besides their large size, partake of some of the other characters of the group just referred to, and thus form the passage from it to Papilio. But the great majority are of very inferior size, and many of them so dissimilar in aspect that they might be thought to afford sufficient distinctions for arranging them in numerous different genera. On a close examination, however, the species are found to be so intimately allied in all essential parts of structure, that the most judicious systematists have not attempted to separate them. Such authors as have followed an opposite course, Hubner for example, have proved by no means successful in establishing subdivisions; and the only effect of such a proceeding is to encumber the subject with a number of generic names without eliciting a more philosophical arrangement, or one better adapted to aid the student. As at present constituted, the genus is compact and

natural; and if it were broken up by attaching undue importance to very subordinate characters, no partial change would suffice; for any principle that might be thought to justify the establishment of one genus, would render it necessary, if consistently acted upon, to create not fewer than thirty or forty. One of the most obvious differences among the species is the presence or absence of a tail; but an arrangement founded on this circumstance, separates, by a wide interval, kinds which are in other respects most closely allied. Nay, the tail itself is often more or less developed in the same species, being sometimes distinct in the one sex while it is inconspicuous or wanting in the other; its value as a diagnosis of genera is thus in a great measure destroyed.

Considerable differences likewise prevail in the appearance of the caterpillars, but these are too imperfectly known to be made the groundwork of an arrangement, even if they were likely to be available for such a purpose by indicating natural groups or affording additional means of characterising them. "Some of them," says Dr. Boisduval, "such as those of *Machaon*, *Alexanor*, *Asterias*, are cylindrical and smooth; others (*Crassus*, *Philenor*), are protected with rather long fleshy prominences; in a very great number (*Pammon*, *Memnon*, *Chalchas*, &c.) the two first segments are attenuated, and capable of being retracted under the third and fourth, which are dilated and often ornamented with ocular spots analogous to those presented by

many of the *Sphingides;* others are short and thick, and furnished with numerous rather short fleshy points; finally, there are some (*Podalirius*, *Ajax*, *Antiphates*) which somewhat resemble snails in shape. The caterpillars of *Papilio* may be distinguished from those of other genera belonging to the same tribe by the following characters:—They differ from those of *Ornithoptera* in their retractile tentaculum not being enclosed in two exterior cases; from those of *Thais*, in the projections which they sometimes present being never hispid at the extremity; and from those of *Parnassius*, in the body being always free from pubescence; but it is more particularly from the characters drawn from the chrysalis and perfect insect that this last genus is distinguished from *Papilio**."

The perfect insects are characterised by very short palpi not passing beyond the eyes, all the joints very indistinct, the third quite invisible; antennæ pretty long, the club slightly curved upwards; abdomen pretty large, the anal valves in the male of moderate size; wings rather strong, the inferior pair having the abdominal margin folded upwards and leaving the abdomen free, their exterior border more or less dentated, and often prolonged posteriorly into a tail.

According to the above definition, the genus comprehends rather upwards of 220 species. They are distributed over almost every quarter of the globe,

* Species général des Lépidoptères, vol. i. p. 184.

but are by far most abundant in intertropical countries. They are more numerous in the new continent than the old, but the difference is by no means considerable. In the former, Brazil alone produces between forty and fifty species; in the latter, the greatest number occur in the islands of the Indian Archipelago, already referred to as the native country of the magnificent Ornithoptera. The continental parts of India, China, Java, &c. likewise possess many fine species, and a few are found in New Holland. Europe is exceedingly poor in insects belonging to this group, there being only four indigenous kinds. These are *P. Xuthus*, *P. Alexanor*, *P. Machaon*, and *P. Podalirius;* the two latter, which are the most common, are well known to extend to Britain.

The first species selected to exemplify one of the prevailing forms of this important genus, is



apilio Memnon. 2. *Pap. Æneas.*

China. Surinam.

Lizars sc

PAPILIO MEMNON.

PLATE II. Fig. 1.

Linn. Fabr. Cramer, 91, C. — Papilio Agenor, *Linn. Fabr. Cramer*, 32, A, B.

The upper wings in this species expand about five inches; they are blackish and marked with numerous longitudinal rays of a greyish-ash colour, each of them having a large blood-red or ochrey-yellow triangular patch at the base. The inferior wings are waved on the hinder margin, and narrowly edged with white in the emarginations, the disk almost entirely occupied by a broad white band divided by the dark nervures, the hinder portion dusky with a series of deep-black spots of an ovate or rounded form, that placed on the anal angle smaller than the rest and encircled with fulvous, which colour extends to the extremity of the internal border; on the under side they are spotted with red or ochre-yellow at the base: body black, the prothorax marked with several white points.

The above description applies to one of the female varieties of *P. Memnon*, which was usually regarded as a distinct species and known by the name of *Agenor*. Indeed it is so unlike the male,

that authors would probably never have thought of associating them, had they not been reared from the same description of caterpillar. The male is entirely without the basal red spot, and the dark ground colour has a greenish reflection; the upper wings have a red or ochreous spot at the base on the under side, and there are likewise four small red marks on the same part of the inferior wings: the latter are deep black anteriorly and cinereous behind; the cinereous portions containing two rows of deep black rounded spots, that next the anal angle encircled with yellow. *P. Androgeos* of Cramer (pl. 91, A. B.) is a variety of this sex, while the *P. Anceus*, and *P. Laomedon*, of the same iconographist are varieties of the female.

The caterpillar, which feeds on the different kinds of *Citrus*, is described by Dr. Horsfield as of a green colour, with an ocelliform lateral mark on the third segment, and a transverse white band; a band of pale green between the fourth and fifth segments, and an oblique white stripe on the eighth and ninth; the anal segment likewise of that colour. The anterior part of the body is considerably attenuated, similar to what is observed in the caterpillars of many of the Hawkmoths. Chrysalis green, reddish-yellow on the back.

This insect is found in China, and the islands of the Indian Ocean, and is rather a common species.

PAPILIO ÆNEAS.

PLATE II. Fig. 2.

Linn., *Fabr.*, *Cramer*, Pl. 279, Figs. A, B, C, D.—*Rösel Insect.* vol. iv. Pl. 2, Fig. 2.—*Godart*, *Encyclop.* No. 24.—*Boisduval*, *Spec. gener.* 286, No. 112.

We have figured this insect as characteristic of a pretty extensive group of butterflies inhabiting South America, distinguished by a peculiar outline, and a certain similarity of design in the markings. The space between the tips of the anterior wings always exceeds by more than one half the space between the anterior edge of these wings and the hinder margin of the posterior pair; that is to say, the width of the insect, with its wings expanded, is more than double its length. The ground colour of the wings is generally deep black, with one or two insulated patches of some light colour on the disk of the anterior pair, and a large blood-red patch in the middle of the hinder wings; the latter deeply dentated on the margin, but without a tail. In *P. Æneas* the upper wings expand about three inches and a quarter: they are velvet-black, becoming lighter towards the apex, with a pretty large green spot, of a somewhat quadrangular shape, towards the interior border, surmounted by three smaller

ones of an obscure white. Inferior wings likewise velvet-black, with a large discoidal patch, deep red anteriorly and carmine behind intersected by dark nervures; posterior margin with obtuse unequal dentations, the notches margined with red. Under side of the inferior wings with five oval, rose-coloured spots, placed in an irregular transverse line. Body black, the sides of the breast spotted with red.

The insect regarded as the female of this species differs greatly from the above: the wings are more rounded at the apex, and there is only a single spot, of shining green, on the upper pair: the notches of the hinder wings bordered with white.

This butterfly is found in greatest plenty in Surinam, but it likewise occurs in other quarters of South America.

The other species belonging to this group, easily recognised by their peculiar *facies*, are, *P. Opleus*, *Hippason*, *Euristeus*, *Polymetus*, *Jacinthus*, *Eurymas*, *Eurymedes*, *Echelus*, *Ariarathes*, *Marcius*, *Numa* (Boisd.), *Cœlus* (Lacordair), *Arbates*, *Anchises*, *Dimas*, *Iphidamas*, *Arcas*, and a few others.



Linnæus.

1. Papilio Ascanius. Brazil. *2. Pap. Paris.* China.

PAPILIO ASCANIUS.

PLATE III. Fig. 1.

Fabr. Drury's Exot. Insects, iii. Pl. ix. fig. 1 ; *Cramer*, Pl. xiv. fig. A.

This insect may be regarded as the type of another South American group, somewhat allied to the preceding in general appearance, and in the distribution of colours, but presenting at the same time considerable differences. The length of the hinder wings is proportionally much greater, and each of them has a pretty long spatula-shaped tail. In the species figured, the wings are deep-black above, inclining to brown on the under side; the superior pair with a broad transverse white band, crossed by black nervures, and surmounted by a white arch, or two or three small white spots at the extremity of the discoidal cell. The hinder wings are likewise traversed by a wide band, frequently deeply notched or palmate, white anteriorly, and tinged with carmine behind; beyond which there is a series of narrow, slightly lunate, red spots parallel with the margin; tail of moderate length, black: body black, with red spots on the sides of the breast and abdomen.

This beautiful butterfly is not uncommon in the northern regions of Brazil, but it becomes scarce in the south.

PAPILIO PARIS.

PLATE III. Fig. 2.

Linn. Fabr. Drury's Ins. Pl. xii. fig. 1; *Cramer*, Pl. 103, A, B; *Boisd. Spec. gen.* p. 208.

P. Ulysses, *Perianthus*, *Bianor*, *Polyctor* (Boisd.), *Blumer* (Boisd.), *Crino*, *Palinurus*, *Paris*, and *Arjuna*, form a very natural group of butterflies, distributed over the eastern parts of the continent of Asia, and the islands of the Indian Archipelago. The great breadth of the wings and tail, combined with the general darkness of their colours, give them a somewhat heavy appearance, but this is often in some degree relieved by great richness of decoration. They are occasionally ornamented with patches of very brilliant azure-blue, and nearly all of them are sprinkled with shining points of golden-green, making the surface appear as if powdered with gold-dust. The species figured as an example is a native of China, and is often received in collections from that country, although it does not appear to be very common. In many cabinets a closely allied species stands for this, which is so similar that the two may easily be confounded. The species alluded to is *Pap. Arjuna*, a native of Java, accurately described by Dr. Horsfield; but although now regarded as

distinct, it may ultimately prove to be a mere local variety. Godart confounds three species, conceiving that *P. Bianor* was the female of *P. Paris*, and *P. Arjuna* a variety. * The extension of the wings in *P. Paris* is about four inches; the surface dark-brown, powdered with particles of golden-green, which are condensed into two or three spots near the extremity of the inner border of the upper wings: the under wings have, towards the middle, a large patch of very brilliant azure-blue, sinuated posteriorly, where it is on a line with a series of spots formed by the union or condensation of the minute golden atoms; the anal angle with an ocellated spot having a red iris surmounted by a very narrow violet arc: tail black: under side brown, sprinkled with grey particles, which are so condensed towards the apex of the upper wings as to form a broad transverse band, interrupted by dark nervures: under wings with a posterior row of seven ocelliform spots, dark in the centre and having a yellowish-red iris, divided anteriorly by a slender violet arc: body black, powdered with particles, in the same manner as the wings.

The female differs only in the ground colour being a little darker, and in having a transverse ray of condensed particles, which reaches from the internal border nearly to the middle.

The caterpillar is probably very similar to that of *P. Arjuna*, described by Dr. Horsfield. †

* Encyclop. Methodique, Art. *Papillon*, p. 67. No. 116.

† Descrip. Catal. of Lepid. of Indian Company, pl. i. fig. 14.

PAP. PROTESILAUS.

PLATE IV. Fig. 1.

Linn. Fabr. Cramer, Pl. 202, fig. A, B ; *Merian's Insec. Surin.* Pl. 43.

The two insects delineated on the adjoining plate exemplify a form which prevails among a pretty extensive group of the genus *Papilio*, and which is familiar to European entomologists as represented in a very characteristic manner by the beautiful *P. Podalirius*. The prolongation of the hinder wings into a long narrow tail is the most striking feature, and has caused them to be termed swallow tails. The ground colour is for the most part pale,—light yellow, or green,—and the wings are marked with numerous transverse stripes of dark brown or black. They are not confined to any particular country, but are distributed over most regions of the globe, although the greatest number are found in Brazil and other parts of America. *P. Protesilaus* is one of the most common inhabiting the country just named. It expands nearly four inches ; surface pale white, almost transparent, tinged with green at the base of the superior wings ; the latter having seven narrow transverse black bands commencing at the anterior margin, the innermost five very short, the sixth descending



1.Papilio Protesilaus. Brazil. *2.Pap. Sinon.* Jamaica.

to the internal angle, where it unites with the seventh. which runs along the margin: inferior wings black at the hinder extremity, that colour divided by two rows of large lunules of the ground colour, the anal angle with a bright transverse spot of carmine-red; tail very long and narrow, bordered with white, and having before its base two or three greyish-blue spots, composed of minute particles. On the under side the most remarkable differences are, that the two interior bands are prolonged to the anal angle, where they unite, and the outer one is bordered on one of its sides with a stripe of carmine: body whitish, with a broad black stripe along the back, another on the sides, and three along the belly.

PAPILIO SINON.

PLATE IV. Fig. 2.

Fabr. Cramer, Pl. 317, fig. C, D, E, F.—*Herbst. Pap.* Pl. 44, fig. 5, 6.—Pap. Protesilaus, *Drury*, vol. i. Pl. 22, fig. 3, 4.

Considerably less than the preceding, the space between the tips of the wings seldom exceeding three inches; wings black, with pale coloured bands slightly tinged with green; viz. two towards the base, extending across both wings, the third very slender and short, the fourth forming a pretty broad central stripe bifid anteriorly, and terminating in a point near the middle of the hinder wings; beyond this are two transverse spots or rudimentary bands anteriorly, and lastly a macular one of rounded spots parallel with the hinder margin; the latter likewise extends along the hinder wings, the spots assuming a crescent shape; anal angle marked with an oblique vermilion spot; tail long, linear, and black. Under side brown, the design corresponding to that on the surface, but having a narrow stripe of red near the middle, placed in a dark band and edged with white on the anal angle: body black, with two white streaks on the thorax, the abdomen ringed with white above, and greyish-white beneath.

Inhabits Jamaica, Florida, and various parts of South America.



1. Leptocircus Curius. 2. Thais Medesicaste

1 Java. . 2 Europe &c.

LEPTOCIRCUS CURIUS.

PLATE V. Fig. 1.

Swainson's Zoolog. Illus. 2d series, Pl. 106.—*Boisduv. Spec. gener.* 380.—Pap. Curius, *Fabr.*—*Donov. Insects of India.*—Erycina Curius, *Godart*, *Ency. Meth.*

This genus was first proposed by Mr. Swainson for the reception of a remarkable insect from Siam and Java, to which various situations had been assigned by different naturalists. In external aspect it has all the appearance of an *Erycina*, but, on examining the disposition of the nervures of the wings, the form of the palpi and antennæ, together with the structure of the feet, which are all complete in both sexes, its close affinity to the true *Papiliones* becomes apparent. The head and body are very thick; abdomen short; eyes large and salient; palpi very short, the articulations very indistinct; antennæ rather long, thickening at the extremity into a club which is slightly curved upwards. The anterior wings are nearly hyaline, and have the discoidal cell closed; the posterior folded longitudinally, and each drawn out into a very long tail curved at the extremity. The expansion of the wings, in the only known species, is about an inch and a half; the inner half of the superior pair black, traversed in the middle by a pretty broad green band; the exterior portion, consisting of a large triangular space, transparent, with the nervures and external border

black. The inferior wings are black, edged externally with white, and having a central blue band in continuation of the anterior one. On the under side, the base of all the wings is whitish, and the abdominal margin of the under pair is marked with three curved white streaks: abdomen whitish beneath, and having a double row of black dots on each side. In the female the bands on the wings are white.

A few years ago this curious butterfly was to be found in very few cabinets, but it is now received not unfrequently.

THAIS MEDESICASTE.

PLATE V. Fig. 2.

Godart's Pap. de France, ii. Pl. 3, fig. 3, 4.—Pap. Medesicaste, *Hubn. Pap.* 124, fig. 632.—Pap. Rumina, *Hubn.* Pl. 394, 395.—Thais Honnoratii, *Boisd. Icon.* Pl. 3, fig. 3—5, var.

The genus Thais is confined to the southern countries of Europe, the north of Africa, and Asia Minor. All the species are of moderate size, and may at once be known by the peculiar design of the colouring of the wings, which are always yellow spotted with red and black, and bordered externally with a dark festooned line. The palpi are composed of three nearly equal articulations, and rise conspicuously above the head; the antennæ rather short and terminating in a club slightly curved upwards. The body is slender, and the abdominal margin of the

hinder pair of wings is curved downwards as if to leave room for the movements of the abdomen. The caterpillars are short and cylindrical, covered with fleshy spines and short hairs, the first segment provided with a fleshy bifurcated tentaculum. They live solitarily or in small groups on the *Aristolochia*, and obviously bear a considerable analogy, as well as the perfect insect, to *Parnassius*. The chrysalis is cylindrico-conic, somewhat angular in front.

The species represented on the annexed plate may possibly be a variety of *T. Rumina*. Surface pale ochreous yellow, with a black marginal band divided on the upper wings by a series of eight or nine yellow spots; along the costal margin are several black irregular transverse bands, some of them inclosing rounded red spots; inferior wings with a black festooned line along the exterior border; towards the base are always three red spots, one near the abdominal margin, another in the upper part of the discoidal cell, and a third near the anterior edge, usually united in the form of a transverse band with that in the cell. Body blackish, marked with rows of fulvous spots.

The caterpillar lives on the *Aristolochia pistolochia*. Sometimes the colour is reddish-yellow, at other times brown or dull yellowish-green, with numerous rows of black lines often interrupted; the body bearing six rows of fleshy spines, of an orange yellow hue, and ciliated with black at the extremity.

The insect is found in Languedoc, in the neighbourhood of Digne, &c.

Genus PIERIS.

According to the definition which it has been found necessary to give to this genus in general works on the lepidoptera, it includes a very extensive range of species, and may be said to be represented in this country by the white butterflies, which British authors generally place in the genus *Pontia*. In this extended acceptation, however, it comprehends individuals somewhat diversified in appearance, and which may be assumed as the types of particular groups or sub-divisions, perhaps of sufficient importance ultimately to become genera, if a corresponding dissimilarity be found to characterise their different states and metamorphoses. The antennæ are of moderate length or slightly elongated, the articulations pretty distinct, the club obconic and compressed; palpi thickly covered with fascicles of long hairs, the terminal joint at least as long as the penultimate: wings of ordinary size, the discoidal cell closed; the under pair partially embracing the abdomen: eyes naked, head rather small.

The caterpillar is elongated, and nearly cylindrical, pubescent, and marked with longitudinal rays; the head small and rounded. Chrysalis terminating in a single conical point anteriorly, attached by the tail and a medial band.

Not fewer than one hundred and sixty-six different kinds of butterflies are referred to this genus. "They are diffused," says Dr. Boisduval, "nearly over the whole globe, but are particularly abundant in the intertropical countries of the old continent. Considering the extent of the New World, it produces comparatively few species. The most remarkable inhabit Africa, the Indian continent and Archipelago, and New Holland. Such of the caterpillars as are known, feed almost exclusively on the *cruciferæ*, *residaceæ*, *tropiolieæ*, and *caparideæ*. Our *P. Cratægi* is the only one in Europe which lives on trees; but it is probable that many exotic kinds are of the same habits. The prevailing colour among these lepidoptera is white, more or less pure, with a black border, variable in width, but seldom wanting. There are likewise species in which the ground colour is yellow or even orange, while in others it is blackish or blue, &c. The inferior face of the posterior wings generally differs considerably from the upper, and is often very agreeably varied with brilliant colours. The sexual differences, in certain species, are very conspicuous, particularly on the surface; in others, they are much less so, the females being distinguished from the males only by a somewhat wider border, or by having the upper wings more rounded at the apex*."

* Species général des Lepidoptères, i. p. 435.

PIERIS EPICHARIS.

PLATE VI. Figs. 1 and 2.

Godart, Boisd.—Pap. Hyparete, *Fabr.*—Pap. Eucharis, *Drury's Insect.* Pl. 10, fig. 5, 6.—*Cramer*, Pl. 201, fig. B, C ♂; Pl. 202, fig. C ♀.

This pretty insect belongs to a sub-division which inhabits the continent of India and the adjacent islands. The wings, which expand about three inches, are white, very faintly tinged with blue, with a broad black border, interrupted by a series of rather larger oval spots, the same as the ground colour on the upper wings, but flesh-colour on the under; the nervures, on the former, defined by a dilated black line: in the female, this is likewise the case with the inferior wings. Under side of the primary wings similar to the surface, except three marginal spots towards the apex, which are yellowish in the male and of a bright yellow in the female; secondary wings bright yellow beneath, the nervures black, and along the hinder border a row of large oval, or somewhat heart-shaped, scarlet spots, placed in a white circle; body whitish.

Common in Bengal, and many places in the more eastern parts of Asia.



1.&2. Pieris Epicharis India. *3. P. Philyra.* Amboina.

Lizars sc

PIERIS PHILYRA.

PLATE VI. Fig. 3.

Godart, *Boisd.*—Pap. Hyparete, *Cramer*, Pl. 210, fig. A, B, and Pl. 339, fig. E, F.

The figure above referred to represents the under side of the female of this handsome species. The male is of a bluish-white above, surrounded with a black external margin, and having a black patch on the tip of the anterior wings, divided by an arched row of white oval spots; the female nearly black above, the inner half of the wings dull white, the apex with white oval spots: on the under side both sexes are black, with the inner half of all the wings yellow, sprinkled with minute black points; the upper pair having a small white spot at the extremity of the discoidal cell, and a posterior row of yellow oval spots largest towards the anterior margin; the under pair with seven long wedge-shaped reddish-brown spots behind the middle, becoming somewhat lighter posteriorly, making the hinder part of the wing from the middle of the discoidal cell sometimes appear entirely of that colour, with dilated black nervures and a black border.

Inhabits Amboina, New Guinea, &c. *Pieris Plexaris*, described by Godart (*Encyc. Meth.* p. 151) from a figure in Donovan's Insects of New Holland, is regarded by a recent author as a variety.

PIERIS BELISAMA.

PLATE VII. Fig. 1.

Godart, Boisd.—Pap. Belisama, *Cramer*, Pl. 258, fig. A, B, C, D.

P. Belisama is another of these handsome and warmly tinted species which abound in Eastern Asia and the adjacent islands. It is generally about a third larger than our common cabbage butterflies, but smaller examples frequently occur; the male yellowish-white above, with the whole of the outer angle and the costa of the anterior wings black; the limb of the hinder pair of the same colour. Female with the greater portion of the upper wings black, the remainder pale ochreous. Under side of the upper wings black in both sexes, with a group of yellow spots on the apex, and a small transverse whitish streak at the extremity of the discoidal cell; the same side of the under wings bright yellow, inclining to orange, with a black posterior border dentated on the inner side, and bearing a row of rounded yellow spots; at the base there is a transverse red stripe lying parallel with the margin; body whitish; antennæ black.

Occurs plentifully in Java, Amboina, Sumatra, &c.



Lizars sc.

1. Java.
2. Cape.
3. Amboina.

1. Pieris Belisama.
2. Anthocharis Danai.
3. Iphias Leucippe.

Genus ANTHOCHARIS.

A section of *Pieris* has lately been established as a genus under the above name, founded, however, on characters not of a very decided description. The most important one perhaps is the shape of the chrysalis, which is boat-shaped, or equally attenuated to both extremities, somewhat arched, and without lateral points. The antennæ of the perfect insect are short, with the articulations distinctly marked, the club rather abrupt and forming an ovoid compressed mass. The common British species *Mancipium Cardamines* is referred to it, and this insect may be regarded as a characteristic example of the kinds which it includes. Like the *Orange-tip*, the majority have a patch of bright red on the tips of the anterior wings, and the under side of the posterior is often beautifully marked with green and pearl white. Several other species, besides that just mentioned, are natives of Europe, but their principal resort seems to be the intertropical countries of Africa.

ANTHOCHARIS DANÆ.

PLATE VII. Fig. 2.

Boisd.—Pap. Danæ, *Fabr.*, *Donov. Insects of India*, Pl. 1, fig. 2.—Pap. Eborea, *Cramer*, Pl. 352, fig. C, D, E, F.—Pieris Danæ, *Godart.*—Pontia Danæ, *Horsfield*, *Insects of Ind. Comp.*, p. 141, 68.

Surface of the male pure white; the upper wings having a large triangular patch of bright carmine at the extremity bounded on the inner side by a black oblique band, and narrowly margined with the same colour externally, where the nervures are likewise black; there is likewise a black point at the extremity of the discoidal cell: under wings with a black border, variable in breadth, and occasionally macular. Under side impure white, with a black streak at the extremity of all the discoidal cells, those on the hinder wings divided by a reddish brown point; the apex of the upper wings fulvous-red, divided by a curved row of blackish spots, continued across the under wings as far as the anal angle. The female differs from the male in having a large space at the base of the wings dusky, and

the marginal band wider, and better defined on its inner edge.

Males sometimes occur in which the marginal band is entirely wanting in the hinder wings.

Found in the East Indies, at the Cape of Good Hope, &c.

Genus IPHIAS, *Boisd.*

The two conspicuous insects which at present compose this genus, were wont to be referred either to Pieris or Colias. They have certainly a close relation to both, as well as to *Anthocharis*, but the following characters seem to warrant their separation; antennæ long, gradually increasing into a club which is truncated at the extremity; palpi contiguous and compressed, thickly covered with scales cut of equal length, the terminal joint minute and truncated; head clothed with rather long projecting scaly hairs; thorax robust; abdomen much shorter than the inferior wings; wings very large and strong, the discoidal cell closed. The caterpillar is attenuated at both extremities and shagreened on the surface, the chrysalis much arched and fusiform at both ends.

IPHIAS LEUCIPPE.

PLATE VII. Fig. 3.

Pap. Leucippe, *Fabr. Cramer*, Pl. 36, fig. A, B, C.—*Donovan*, *Insects of India*.—Pieris Leucippe, *Godart*.

One of the largest of the *Pierides*, frequently measuring upwards of four inches between the tips of the wings; anterior pair bright fulvous red, clouded at the base with greenish yellow, the nervures and all the exterior parts black, the female with a row of fulvous spots parallel with the external margin, and not far from it; posterior wings citron-yellow, having a dentated or macular black border in the female, usually preceded by a curved line of spots of the same colour; but in the male marked with only one or two black spots towards the external border. Under side deep fulvous in both sexes, sprinkled with black points and marked with short transverse dusky lines, which are greatly most numerous in the female; head and thorax brown; abdomen citron-yellow; antennæ black, the extremity of the club reddish.

It is a native of Amboina; we have seen no particular account of the caterpillar, but it is no doubt similar to that of *T. Glaucippe*, which is described by Dr. Horsfield as of a green colour with a white lateral ray. It feeds on a species of *Capparis*.

Genus CALLIDRYAS.

This genus is composed of a selection of species from Colias, to which it bears a very close relation. It is not long since it was proposed by Dr Boisduval, who thinks that the following characters entitle it to this distinction. Palpi approximating and very much compressed, clothed with short hairs and dense scales, the terminal joint conical and much shorter than the preceding one; antennæ thickening gradually from the base to the apex, which is distinctly truncated; body robust, the abdomen much shorter than the inferior wings; the latter forming a groove which completely embraces the under side of the abdomen. The caterpillars are naked and somewhat attenuated at both extremities; the chrysalis arched, or boat shaped, with the extremities drawn out to a narrow point; always attached by the tail and a transverse band.

According to the manner in which they have been respectively constituted, *Callidryas* therefore is best distinguished from Colias by the antennæ, which in the latter terminate in an obconical club; and from *Rhodocera* (including *Gonopteryx* of Dr. Leach), which has these organs likewise truncated, by the shape of the wings, which never present acute angular projections. The prevailing colour of the

species is yellow, from deep orange to the palest sulphur yellow. The females are usually of a paler hue than the males, and the sexual differences are strongly marked in other particulars. On the under side of the wings there are almost invariably one or two small spots, near the middle, of a silvery or rusty-brown hue; these are either wanting or very minute in the males, while they are distinctly marked in the females. The former sex, in the majority of species, presents a very peculiar character in having the anterior edge of the under wings provided with a kind of pulverulent glandular sac, which varies much in size and colour in different species.

A great similarity prevails among the different species of *Callidryas*, and they are consequently difficult to determine. They inhabit the intertropical regions of the two continents.

CALLIDRYAS EUBULE.

PLATE VIII. Fig. 1.

Pap. Eubule, *Linn. Cramer*, Pl. 120, F, C.—Caterpillar, *Stoll's Supp. to Cramer*, Pl. 3, fig. 1, A.—Callidryas Eubule, *Boisd. Species general*, i. 613.

This insect so closely resembles *C. Marcellina* that it is possible they would still have continued to be confounded, as they were by the earlier entomologists, had not the different appearance of the caterpillar indicated their essential distinction. In the male the surface of the wings is a fine citron-yellow, with a narrow border of a deeper hue; the fringe of all the wings marked at remote intervals with small rust-coloured spots. Beneath the colour is red, or brownish-yellow; the upper wings with a double ferruginous spot at the extremity of the discoidal cell, and a brownish zig-zag ray towards the outer margin; the under wings likewise with two rounded discoidal spots, silvery in the centre, and surrounded by a rust-coloured ring; there are likewise several undulating brown lines running across the surface more or less distinctly defined. The female is bright yellow inclining to orange, the inferior wings much rounded, and having an orange-coloured fringe interrupted with transverse brown



1. *Callidryas Eubule with Cater. & Chrysalis.* Brazil.
4. *Terias Mexicana.* Mexico.

stripes. The position and appearance of the discoidal spots similar to what has been described in the male: the under side deep ochre yellow. Body yellow, with greenish hairs on the thorax; antennæ, and terminal joint of the palpi, rose-colour mixed with brown.

The caterpillar (Pl. VIII. fig. 2) is green, covered with small black granules, and having a yellow line along each side, surmounted by another of a blue colour. It feeds on the different kinds of *Cassia*. The chrysalis (Pl. VIII. fig. 3) is likewise green, changing ultimately to brown.

The butterfly is very common in Guiana, Brazil, and many other parts of America.

Genus TERIAS.

We owe the establishment of this genus to Mr. Swainson. It includes a considerable number of species, the greater proportion of which have been but lately discovered. They are small insects, of delicate structure, and usually of a light yellow colour, with the apex of the upper wings deep black. The caterpillars, as far as we are acquainted with them, are attached to leguminous plants, and live between the tropics both of the old and new world. The most important generic characters are the following: antennæ of moderate length, the articulations pretty distinct, terminating in an ovoid or conical club, which is slightly curved downwards, and compressed laterally: palpi very short, the terminal joint half the length of the preceding one, naked, and a little salient; abdomen slender and compressed, nearly as long as the inferior wings; wings of delicate texture, the costal line a good deal arched towards the base. Caterpillars slender, linear, and pubescent; chrysalis a little arched, and somewhat compressed, terminating in a point anteriorly.

TERIAS MEXICANA.

PLATE VIII. Fig. 4.

Boisd. Spec. gen. p. 655. Pl. iii. C, fig. 1.

This insect was discovered not long since in Mexico, and is considered rare. The colour of the surface is very bright citron-yellow, the upper wings with a broad black border externally, which ends in a quadrangular expansion a little before the middle of the internal margin. The under wings have the outer border prolonged into an acute angle, forming a kind of rudimentary tail, and the anterior half is widely bordered with black. The primary wings are pale citron-yellow on the under side, with a central black point, and have the outer border near the fringe tinged with red; the secondary pair yellow, speckled with ferruginous particles, and having a black point in the centre, the extreme angle marked with a ferruginous spot, and the posterior half with four or five other spots of the same colour, having sometimes a tendency to form an irregular transverse band. The above description applies to the male; the female has the surface of the wings whitish-yellow, with the black border broader, and the anterior margin of the secondary wings widely orange-yellow. The expansion varies from twenty to twenty three lines.

Genus EUPLŒA.

This and several of the following genera may be readily distinguished from any of the preceding by having the anterior legs, in both sexes, short and imperfect, the tarsi not being distinguishable into five joints, but generally consisting of a single piece with several crowded spines at the extremity. In the present genus there is a slight indication of an articulated structure, but very indistinct, and there are scarcely any projecting points in the room of claws. The antennæ, which are placed very close to each other at the base, terminate in a pretty thick club elongated and somewhat curved. The palpi, which stand considerably apart from each other, are short, not rising above the head, densely clothed with hair-like scales which completely conceal the joints: of the latter the terminal one is minute and globular ending in a point, the second long and thick, the radical one about one-third its length. Outline of the upper wings triangular: claws simple. Chrysalis suspended by the tail, and never supported by a band round the middle.



1. *Euploea Limniace*. E. Asia.
2. *Plexippe*. China &c.

EUPLŒA LIMNIACE.

PLATE IX. Fig. 1.

Danais Limniace, *Godart.*—Pap. Limniace, *Cramer*, Pl. 59, fig. D, E.—Pap. Similis, *Fabr.*

Expands nearly four inches; surface of the wings deep black, entirely covered with stripes and spots of shining light green, more or less mixed with white: towards the base of the wings the green colour is arranged in longitudinal stripes, externally in rounded spots, becoming smaller at the hinder margin where they form a regular row. The design on the under side is similar, but the ground colour of the under wings and a large space at the apex of the upper are pale brown, and the green marks are usually pale; the sinuosities fringed with white, the projections on the margin of the hinder wings forming a pretty acute angle; thorax and breast black, with numerous white points; abdomen yellowish beneath.

Rather extensively distributed over the eastern countries of Asia, and the adjacent islands.

EUPLŒA PLEXIPPE.

PLATE IX. Fig. 2.

Danais Plexippe, *Godart.*—Pap. Plexippus, *Linn.*, *Fabr.*—Pap. Genutia, *Cramer*, Pl. 206, fig. C, D.

This insect affords an example of a pretty extensive and beautiful group which is strikingly characterised by the prevalence of a peculiar colour and uniformity of design in the markings. The ground colour is a rich chestnut-brown, varying considerably in the intensity of the shade, the wings widely margined on the outside with black, more or less interrupted with white spots; the black colour sometimes running along the nervures in a broad stripe. They are common both to the old and new world, and many of them are very abundant. *E. Plexippe* occurs in the East Indies and China, also in the islands of Java, Ceylon, &c. and often appears in great plenty. The colour is light chestnut-brown, approaching to fulvous, the whole external border of the wings with a broad black band, dilated at the apex of the superior pair so as to occupy the whole angle; this band bears two rows of small unequal white spots, and the black space at the summit of the upper wings has a broad oblique band of pure white, angular on the edges, and formed

by the confluence of five spots; between this and the middle of the costa is a small group of white spots: all the nervures black and dilated. The under side differs in having the space between the white patch at the apex of the upper wings and the external margin ashy-brown; in having the ground colour of the inferior wings pale fulvous, and the nervures of the same wings narrowly edged with white. The abdomen is nearly of the same colour as the wings; the thorax, breast, and head black, punctured with white; antennæ black, the extremity of the club rust-red.

Genus IDEA.

The above genus is of very limited extent, comprehending only four species. They are, however, somewhat remarkable insects, both on account of their size, and the manner in which their colours are distributed. The wings are slightly transparent and of a greyish white, with black stripes running along all the nervures, and occasionally forming blotches on the surface. The nearest approach to this mode of colouring among other tribes is presented by certain species of Euplœa, and particularly by *Pap. dissimilis*, which on this account has been termed the Idea-likeness butterfly. The most conspicuous of its generic characters are the slenderness of the antennæ, which are so slightly thickened towards the apex as to appear nearly filiform, and the elongated oval form of the wings: in other respects Idea nearly conforms to the genera with which it is associated. The palpi have the terminal joint minute and conical, the second long and thickest in the middle, the radical one not half its length. The tarsal division of the anterior legs is dilated, and furnished with two or three unequal spines.



1. *Idea Agelia*. 2. *Idea Daos*.

Java. Borneo.

IDEA AGELIA.

PLATE X. Fig. 1.

Pap. Idea, *Linn. Fabr. Cramer*, Pl. 193, fig. 1, A, B, and pl. 362, fig. D.—*Donovan's Insects of India.*

Varying in size from upwards of six inches across the wings to nearly four and a half. The surface is of a greyish white, with the nervures and posterior border black; the latter sinuated internally, and divided by a series of large spots of a whitish colour, and generally an oval shape; between each of the nervures, and beyond the middle of the wing, is a longitudinal black stripe: the primary wings are moreover marked rather before the middle with four irregular black spots, the anterior one on the costa, the other three forming an abbreviated arched band. The under side does not differ materially from the upper, but the black stripes are rather broader, and there is a large irregular patch in the discoidal cell. The body is whitish with a black line along the back, the thorax having two black central lines and two short transverse ones at their extremity: the breast is marked with oblique black lines, and a row of dusky points runs along each side of the abdomen: antennæ black.

The insect is a native of Java, Amboina, and other Asiatic islands.

IDEA DAOS.

PLATE X. Fig. 2.

Boisd. Spec. gen. Pl. 24, fig. 3.

This delicate and handsome species is much the smallest, the expansion of the wings not being quite four inches. The ground colour is dusky white, with two remote rows of rounded spots, another at the extremity of the discoidal cell, and several smaller ones on the costa beyond the middle. The abdomen is entirely whitish, the thorax with two connivent black rays on the back and numerous black spots anteriorly: antennæ black.

It is said by Dr. Boisduval, to whose excellent work we are indebted for a knowledge of it, to be a native of Borneo.

Genus HELICONIA.

This beautiful genus is easily recognized by its peculiar aspect, as well as by the more precise characters which it affords. The anterior wings are long, narrow, and entire, and the hinder pair often recede considerably from the abdomen, which is long and slender. The breadth of the insect, therefore, when flying, always greatly exceeds its length. No lepidopterous insect is ever entirely without scales, but in a section of this group, they are so few and minute as to leave the wings perfectly transparent. The palpi rise obviously above the head; the second joint is greatly longer than the first, and has a long tuft of hair near the apex, the terminal one is also a good deal produced. The antennæ are, at least, double the length of the head and thorax, and thicken gradually at the extremity. The anterior tarsus is considerably dilated and slightly dentated; claws simple. Such of the caterpillars as have been described, differ remarkably from each other, and some of them seem to have no analogy with those of the neighbouring groups. This discrepancy, in connexion with some others in the perfect insects, has already led to the separation of certain groups from *Heliconia* as it was formerly constituted. The larva of *H. Euterpe* is robust and

depressed, with a series of long fleshy lobes on each side; that of *H. Calliope* short and cylindrical, clothed with slender spines and tufts of hair: these species form the genus *Nerias*, although they are too dissimilar to be associated with propriety. Others are smooth *(H. Psidii)*, and some are covered with very long white hairs *(H. Ricini)*. In these circumstances, it is not likely that a natural arrangement of this pretty group will be effected until we become better acquainted with the caterpillars, very few of which have hitherto been examined. Chrysalis invariably suspended by the tail only.

These insects, as has been already mentioned, are confined to America and the West India Islands, the larva subsisting on the different kinds of *Passifloræ*, a beautiful tribe of plants well known to be likewise peculiar to the new world. They seem to be represented in India, as Dr. Horsfield remarks, by the genera *Euplœa* and *Idea*.



1.Heliconia Erato. 2.H. Cynisca. 3.H. Sylvana.

1 Surinam.
2 Guiana.
3 Surinam

Lizars sc

HELICONIA ERATO.

PLATE XI. Fig. 1.

Godart.—Pap. Erato, *Linn.*—Heb. Ricini (Mas.), *Fabr.*—Pap. Amathusia, *Cramer*, Pl. 177, fig. F.

Extent of the wings about three inches; the ground colour deep black. Upper wings with three diverging rays of deep red at the base, the inferior one longest and extending rather beyond the middle; not far from the extremity of these rays there is a large discoidal patch of sulphur-yellow, unequally divided into two parts by a black bifurcated nervure; beyond this, near the apex, is a series of contiguous spots of the same colour, varying from two to five. Under wings with six deep red rays extending from the base towards the hinder margin, and behind the place where these terminate, an arched row of small blue spots. The colour beneath is dark brown; the upper wings marked nearly as on the surface, except that the costa at the base is alone tinged with red; under wings with eight diverging pale-red lines, and a row of whitish marks parallel with the hinder margin. Body black; the sides of the thorax and abdomen marked with small yellow

spots. In the beautiful variety figured, the red lines on the secondary wings, as well as the discoidal nervure, are bordered with a narrow stripe of shining blue.

This species is a native of Surinam, where it occurs not unfrequently.

HELICONIA CYNISCA.

PLATE XI. Fig. 2.

Godart.—Pap. Ricini (Fem.), *Linn.*—H. Erato, *Fabr.*—Pap. Vesta, *Cramer*, Pl. 119, fig. A.

This species presents a considerable similarity to the preceding, both in size and distribution of colours. The surface is deep black; a large portion at the base of the anterior wings fulvous-red, traversed by three black nervures; near the middle a large spot of sulphur-yellow, and beyond it a circular series of smaller unequal spots of the same colour. The under wings have from five to seven red stripes, extending in a radiated form from the base towards the hinder margin. Beneath the design is similar, but the ground colour inclines to brown, and one of the yellow spots on the superior wings is prolonged nearly to the base. The body is black, the sides of the thorax spotted with yellow, and the breast marked with transverse lines of the same colour; there is likewise a yellow line along the under side of the abdomen.

The above description applies to the most ordinary form of this insect, but it is liable to a good deal of variation. It occurs in Guiana.

HELICONIA SYLVANA.

PLATE XI. Fig. 3.

Godart.—Pap. Sylvana, *Cramer*, Pl. 364, C, D.—*Herbst.*, *Pap.* tab. xvii. fig. 1, 2.

This handsome species measures upwards of three inches and a quarter between the tips of the wings; the latter are very much rounded, entire on the edges, and the hinder pair diverge widely from the abdomen; the superior fulvous from the base to the middle, with the costa, a slender streak at the base, and a central kidney-shaped spot, black; beyond this a pretty wide oblique band of sulphur yellow; the space between this band and the apex deep black, with eight unequal spots of dull yellow, slightly transparent, disposed in two irregular transverse bands, and two or three small white points at the apex. Inferior wings likewise with the inner half fulvous, the outer half black, emitting narrow stripes internally, one of which reaches nearly to the base, dividing the wing into two portions; towards the hinder margin are a few yellow spots: body cinereous, with a yellow longitudinal line on each side, and a similarly coloured band along the belly; antennæ reddish-brown, dusky at the base.

A native of Surinam.



1.2. Heliconia flora.
3. ——— diaphana.
4. Acraea Pasiphae.

Lizars sc.

1 & 2 from Surinam. 3 Jamaica. 4 Africa.

HELICONIA FLORA.

PLATE XII. Figs. 1 and 2.

Godart.—Pap. Flora, *Cramer*, Pl. 257, fig. B, C

The above plate affords examples of that division of the Heliconian butterflies, in which the greater proportion of the wings is denuded of scales and transparent. *H. Flora* of Cramer very closely resembles *H. Ægle* (Fabr.), and may possibly prove a mere variety of that species. It expands nearly two inches. The upper wings are black with two transparent bands, that next the base very large, lying parallel with the costa as far as the middle, and then descending obliquely towards the posterior angle, divided by a transverse black stripe, and a longitudinal nervure of the same colour; the second band macular, and placed near the apex. The under wings are transparent, the whole of the outer border surrounded by a black stripe, which is divided towards the angle by a fulvous line; the nervures black. Under side similar in design to the upper, but the whole of the outer border of the wings surrounded by a rust-coloured line, and the extreme

edge marked with a few very small white points. Body cinereous above and greyish beneath; antennæ black.

The caterpillar probably resembles that of *H. Ægle*, represented by Madam Merian, which is brown, clothed with hairs, and feeds on the *Sophora*. Both species are found in Surinam.

HELICONIA DIAPHANA.

PLATE XII. Fig. 3.

Godart.—Pap. Diaphana, *Fabr.*, *Cramer*, Pl. 231, fig. C, and Pl. 315, fig. D, E.—*Drury's Exot. Insects*, ii. Pl. 7, fig. 3.

About the size of the preceding, but the wings narrower and wholly transparent, with the outer margin and nervures brownish-black. On the upper wings, rather beyond the middle, there is a black abbreviated transverse band, placed somewhat obliquely, and preceded by a small white spot on the costa. On the under side the marginal band is not so dark as above, and there is frequently a series of small white spots on the hinder edge of the posterior wings; in the latter also, the anterior edge is tinged with sulphur yellow. Body black above and grey beneath, with white points on the head; antennæ black.

The marginal band varies in breadth, and in the secondary wings it is sometimes longitudinally divided by a narrow line of rust-red.

Occurs in Jamaica, Brazil, Virginia, &c.

Genus ACRÆA.

The insects of this genus are generally below the middle size, and of a brownish-red colour, variously striped and spotted with black. With the exception of a small division, which ought probably to be referred to another genus, they are natives of the old world, principally of the western coasts of Africa. The palpi are slender and nearly cylindrical, the terminal joint minute, forming a kind of nipple on the apex of the second which is very long; antennæ rather short and terminating somewhat suddenly in a club; anterior tarsus spatulate, scarcely toothed at the extremity; internal edge of the inferior wings not embracing the abdomen. The caterpillars are either spiny, like those of *Argynnis*, or covered with rigid hairs, but we are yet acquainted with very few of them. The chrysalis is suspended by the tail.

ACRÆA PASIPHÆ.

PLATE XII. Fig. 4.

Godart.—Helic. Pasiphæ, *Fabr.*—Pap. Media, *Cramer*, Pl. 81, fig. C, D.

Surface of the wings white, with a slight tinge of blue, a large space at the base, and the nervures brown; the whole of the middle portion clouded with black spots of various dimensions, and the extremity bordered with a rather wide black band, sinuated on the inner side. The under side is paler and has the marginal band interrupted by a row of small greyish-blue quadrangular spots preceded by a reddish macular line. Body black above, variegated with white marks on the back, and yellowish beneath.

Found in Guinea, and other countries on the west coast of Africa.

Genus CETHOSIA.

This genus includes several pretty large and showy insects, several of which have some resemblance, in the wide expansion of their wings compared with their limited breadth in the direction of the body, to the genera immediately preceding, while others shew a decided affinity to *Argynnis*. The greater part of them are natives of America, but others occur in the eastern countries of the old world. The palpi are contiguous below, but diverge at the extremity, and terminate in a slender acicular joint; antennæ with an oblong club; inferior wings embracing the abdomen; claws simple. The caterpillars appear to be generally spiny, and to resemble those of *Argynnis*.



Cethosia Dido.

Lizars sc.

CETHOSIA DIDO.

PLATE XIII.

Ceth. Dido. *Fabr.*—Pap. Dido, *Linn.*—*Marian's Surin. Insects*, Pl. 2, (with Caterpillar).—*Cramer*, Pl. 196, fig. E, F.

This species expands about four inches; the ground colour of the surface is black, variously interrupted with stripes and patches of green. On the upper wings a longitudinal stripe of that colour extends from the base to the extremity of the discoidal cell; beyond which there is a transverse series of large contiguous spots, and two or three small insulated ones. The inferior wings have two transverse green bands, one of them broad and continuous placed near the base, and terminating nearly in a point towards the outer margin; the other consisting of six or seven orbicular spots, and placed nearly midway between the former band and the hinder extremity. The under side differs considerably from the upper, the ground colour being blackish-brown, while all the green parts are bordered with pearl-white, and along the posterior margin there is a series of white lunules, each of them divided by a brown nervure; near the origin of the secondary wings a small longitudinal red line is likewise observable. The body

is blackish above and grey beneath, the thorax marked with a few reddish points.

The caterpillar has been figured by Madam Merian. She represents it as bearing several rows of short spines, rising in a radiated manner from a tubercle, and two very long caudal appendages. It is of a green colour, having a red and white ray along each side of the body.

The insect is found in Brazil and Guiana.



Cethosia Cyane.
Coast of Malabar

Lizars sc

CETHOSIA CYANE.

PLATE XIV.

Pap. Cyane, *Linn.*—Cethosia Cyane, *Fabr. Godart.*—Pap. Cyane, *Drury*, i. pl. 4, fig. 1. var.

Extent of the wings nearly four inches, the length not much exceeding the breadth, the whole external margin deeply dentated and the notches margined with white. Upper wings fulvous towards the base and spotted with black; the external half brownish-black, traversed by an oblique white band, having two rounded black spots at its lower extremity; behind this are a few white marks in the shape of a horse-shoe, and a line of white lunules; and on the margin itself a narrow festooned white line. Surface of the secondary wings fulvous-yellow, with several irregular black spots near the base, and three regular transverse rows of black spots, the innermost formed of small rounded spots, the intermediate one of larger spots surrounded with white, and the external one of spots inclining to a crescent-shape; the hinder margin brownish-black with a festooned white line similar to that on the upper wings. The whole of the under side is reddish-yellow, with markings nearly corresponding to those on the surface, but on the anterior wings there are

several abbreviated transverse yellow lines anteriorly, bordered with black; and the under wings are traversed by two yellow bands, bearing rows of black spots. The body is fulvous above, and spotted beneath with black.

Found on the coast of Malabar. Drury's figure seems to represent a variety.

Genus VANESSA.

The insects referred to this genus, which is well known as having many handsome representatives in Britain, are distributed over almost every quarter of the globe. Besides those which occur in this country, many others are found on the continent of Europe, and they are equally abundant in tropical regions. Contrary to what is observed in most other instances, the species inhabiting the latter are in general not superior in size or richness of colours to those of temperate latitudes; our own *V. Atalanta* will contrast favourably with any of them. Among the few exceptions to this remark, in respect to size, may be mentioned *V. Arsinoe* and the rare species figured on the adjoining plate. The latter is

VANESSA JULIANA.

PLATE XV. Fig. 1.

Godart.—Pap. N. Juliana, *Fabr.*—Pap. Juliana, *Cramer*, Pl. 280, fig. A, B.—*Herbst. Pap.* Pl. 220, fig. 1, 2.

It is the largest of the Vanessæ, measuring nearly five inches across the upper wings. The surface is dull brown, with a broad common transverse band of greenish white, placed between the middle and the external margin of the wings. On the upper wings this band is composed of a double series of spots, the interior ones small and crescent-shaped, the exterior large and oval with a large black mark in the centre: on the under wings it is more continuous, with a row of white lunules externally, and two large ocelli, remote from each other, having a blue pupil and a yellow iris. The under side is much paler than the upper, and the band on the anterior wings is nearly as entire as in the posterior pair.

This conspicuous species is a native of the island of Amboina.



1 Vanessa Juluana.
2 V. Amathea
3 V. Orithya.

1 Amboyna. 2 Brazil. 3 China.

VANESSA AMATHEA.

PLATE XV. Fig. 2.

Pap. N. Amathea, *Linn. Fabr.*—Pap. Amalthea, *Cramer*, Pl. 209, fig. A, B.

The surface of the wings in this pretty insect is dark brown approaching to black, with a broad band of deep red running across the centre of both wings, but scarcely reaching the anal angle, and bifid at its anterior extremity: beyond this on the anterior wings are two transverse rows of small white spots, both of them irregular; and on the hinder pair a single row of similar spots: the notches on the margins of the wings are also whitish. The under side is much paler than the surface, but the markings are similar. Body dull black above; antennæ of the same colour, with the extremity of the club reddish. Expansion of the wings from two inches to two and a quarter.

A South American species, inhabiting Brazil, Guiana, &c.

VANESSA ORITHYA.

PLATE XV. Fig. 3.

Godart.—Pap. N. Orithya, *Linn. Fabr.*—*Roesel's Beslust. Insect.* vol. iv. pl. 6, fig. 2.—Pap. Orithya, *Cramer*, Pl. 19, fig. C, D; Pl. 32, fig. E, F; Pl. 281, fig. E, F: Pl. 209, fig. A, B, C, D.

This very elegant species, which is a native of China and the island of Java, is subject to much variation in its colour and markings. In its most ordinary state the colour of the surface is velvet-black in the male and dark brown in the female, with two large ocelli on each wing having a violet-blue pupil and a yellowish-red iris. The costa of the primary wings is generally dull white, and towards the base are two or three transverse stripes alternately blue and tawny-yellow; towards the apex are three whitish bands, the interior one broadest, the middle one interrupted by the ocellus, the third narrow and lying along the external margin. The secondary wings are surrounded by a white band divided throughout its whole length by a double undulating black line; the space between this band and the middle of the wing bluish-green in the male, a colour which scarcely appears in the female, and the anterior portion generally black in the former sex. Under side pale, the transverse stripes much elongated and

six in number; the under wings greyish-brown or greyish-white, with several obscure undulating lines towards the base, with a row of four or five unequal ocelli having a blue iris in the female, but almost obsolete in the male. Body black above, greyish beneath.

The figure represents a variety of the female, the same as that delineated by Cramer.

The caterpillar, beset with branched spines, is of a black colour with numerous scattered white points, and has a white line along each side above the legs, and two rows of yellowish brown spots.

CHARAXES JASIUS.

PLATE XVI.

Ochsenheimer.—Pap. Jason, *Linn.*—Pap. Jasius, *Fabr.*—Esper. cater. and chrys.—Drury's Insects, i. Pl. 1. fig. 1.—Pap. Jason. *Cramer*, Pl. 339, A, B.—Nymph. Jasius, *Godart*, *Latreille.*

The genus *Charaxes* was separated from *Nymphalis* by Ochsenheimer for the reception of this butterfly, which may be regarded as the most beautiful inhabiting Europe. It varies in the expansion of the wings from three to four inches; the surface a rich silky brown, changing slightly with the light. Along the hinder margin of the primary wings there is a broad fulvous band, more or less sinuated on the inner side and narrowly edged with black externally, divided by eight nervures, which are dark brown; rather beyond the middle of the wing, a transverse band of large fulvous continuous spots extends from the costa to the inner margin, and is sometimes continued for a short way on the secondary wings; the latter likewise with a posterior band, formed of contiguous spots of a fulvous colour, more or less tinged with green, preceded by a series of from five to seven bluish-green spots, commencing at the anal angle; the margin itself black, as well



Lizars sc

Charaxes Iasius
S. Europe

as the projecting angles, two of which are prolonged into tails. Beneath, the anterior portion of all the wings is rust-red, marked with spots and transverse stripes of olive-brown, encircled with white; beyond this there is a white band of a satiny lustre, bordered externally on the upper wings with dusky lunules; the space beyond these lunules is fulvous, traversed by a band of slate-grey, with a series of black spots, inclining to triangular, on the inner side of it. Beyond the white band on the secondary wings there is a row of ferruginous spots, succeeded by an olive-coloured space bearing a row of violet-blue points; the posterior band similar to that on the upper side. Head and thorax rust-brown; abdomen dull brown, with greyish hairs; antennæ black, proboscis shining rust-red.

The female scarcely differs in appearance from the male, except in having the under side of the hinder wings finely sprinkled in the middle with blue points.

"The Jasius butterfly is one of the largest, rarest, and most beautiful of the European diurnal Lepidoptera. It occurs in the southern countries of France, for example, in the neighbourhood of Lyons, the Isles d'Hières, near Toulon and Montpellier; also in Italy, Sicily, Corsica, some parts of Northern Africa, and in Asia Minor. Lefebure de Cerisy of Toulon has payed considerable attention to the metamorphoses of this fine insect. The caterpillar, which in its early stage is green, becomes afterwards of a yellowish hue, and its skin is as it were shagreened and transversely plaited. Its head is

singularly armed with four vertical yellow horns tipped with red, of which the two intermediate are the longest. A yellow line passes along each side of the body in the region of the stigmata, and the back is marked with four indistinct orange spots. The true feet are black, the membranous ones green. It feeds on the leaves of the strawberry tree, and never eats except during the night. Its habits are very lethargic. During day-light it remains fixed and motionless on its favourite plant, which it resembles in colour, and thus escapes observation. The chrysalis is smooth, thick, carinated, and of a coriaceous texture, the colour pale green. Two broods or flights of the perfect insect are produced each year, the first in June, the second in September. The caterpillars of the autumnal brood survive the winter, and are not transformed into chrysalids till the ensuing May. The perfect insects are then produced in about fifteen days. These speedily deposit their eggs, which are hatched in June, and after three months occupied in the usual transformations, the second flight appears in September, and continues the race in the manner above mentioned. In many parts of France the butterfly is named the *Pacha with two Tails**."

* Wilson's Illust. of Zoology, fol. 27.



Lizars sc

1. *Nymphalis Ethiocles.* 2.3. *N. Tiridates*

Africa. Java.

NYMPHALIS ETHEOCLES.

PLATE XVII. Fig. 1.

Pap. Etheocles, *Fabr.*—*Cramer*, Pl. 119, fig. D, E.—Nymph. Etheocles, *Godart.*

This and the following species present an outline very similar to that of *C. Jasius*, and they might even, without much impropriety, be referred to the same genus; but, as there are several points of difference, and as we are yet unacquainted with the caterpillars, it may be preferable in the mean time to allow them to remain in the situation they occupied in Latreille's arrangement.

N. Etheocles is a native of Africa, and is found chiefly on the coast of Guinea. It is nearly of the size of *C. Jasius*; the surface greenish-black, with a broad white band running obliquely across the middle of the wings; on the primary wings this band is divided into spots and contracted anteriorly, having a group of three or four small white spots on the inner side near its origin. Besides the white band, which is regular and continuous, the under wings have a row of white crescents parallel with the hinder border, succeeded by a black line, the border itself of a lighter green than the general

ground colour, and having a few rust-coloured crescent-shaped marks. On the under side the prevailing colour is pale brown, somewhat glossy, with a white band similar to that described; three ocellated spots are observable at the base of the upper wings, and in the same situation on the other pair are three black transverse lines edged with blue. The internal angle of the superior wings bears a double black spot, and a series of violet lunules runs along the hinder border of the under wings; the border itself green marked with a row of black points.

NYMPHALIS TIRIDATES.

PLATE XVII. Fig. 2 and 3.

Pap. Tiridates, *Fabr. Cramer*, Pl. 161, fig. A, B; *Drury's Insects*, iii. Pl. 23, fig. 1, 2; *Donov. Insects of India*, Part iii. Pl. 2, fig. 3.

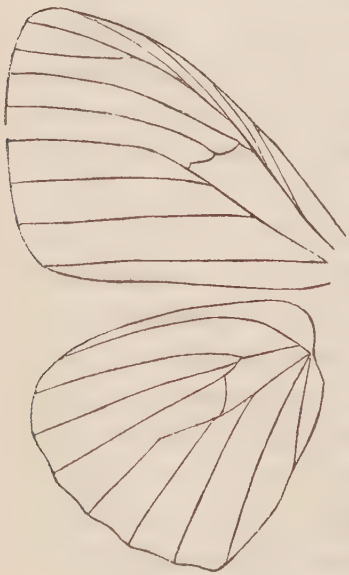
Extent of the wings nearly four inches, the surface very dark blue approaching to black, the nervures brown; beyond the middle are two transverse rows of small round spots of pale blue, and along the hinder margin a series of small dull yellow crescents. The ground colour beneath is brownish-grey, somewhat glossy; the superior wings having a few transverse waved streaks of black edged with blue towards the base, then a few yellow streaks succeeded by a pretty regular row of yellow spots, and on the internal angle are too black spots, partially or wholly surrounded with blue and surmounted by yellow crescents: under wings marked in a manner somewhat similar to the upper pair at the base; the hinder margin with a continuous row of violet ocellated spots, preceded and followed by a row of yellow lunules; tails rather short and slender, brown; body dark brown above with four whitish points on the head, the under side inclining to yellow, antennæ black, the palpi yellow beneath.

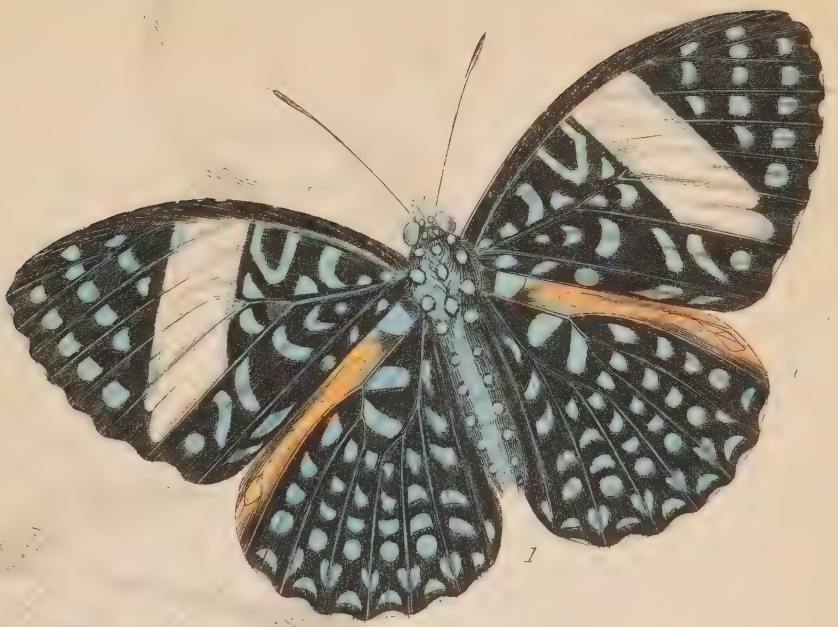
Found in the islands of Java and Amboina.

PERIDROMIA ARETHUSA.

PLATE XVIII. Fig. 1, *Fem.*

This genus has lately been proposed for the reception of a few species formerly classed among the *Nymphales*. They are remarkable for having the surface covered with blue markings on a dark ground, and in other respects seem to be entitled to generic distinction. The neuration of the wings presents the annexed arrangement. — The caterpillar (at least of *P. Amphinome*) bears some resemblance to that of *Morpho*. It is long and attenuated behind, the anal extremity deeply forked, and the head armed with eight strong unequal spines, resembling a kind of coronet. The chrysalis is elongated, bifid anteriorly, and having a series of dorsal spines. They are natives of the New







1. Peridromia Arethusa. 2. P. Amphinome.

S. America

Lizars sc

World. The male of the species above referred to is of a deep black colour on the surface, with a silky gloss, sprinkled with numerous small blue spots; the female is larger, and besides markings similar to those of the male, has a broad white band in the middle of each of the superior wings lying obliquely, and terminating in a point. The whole of the under side, in both sexes, is shining brown with a very slight tinge of green; the hinder wings with ten rounded bright red spots, three near the base, two on the interior edge, and five forming a row on the hinder margin towards the anal angle. The white band is likewise conspicuous on the under side of the female, and in place of it, in the male, there is a bluish interrupted oblique line; body black above and spotted with blue; brown beneath, with red spots on the breast.

This beautiful species is a native of Brazil.

PERIDROMIA AMPHINOME.

PLATE XVIII. Fig. 2.

Pap. Amphinome, *Linn. Cramer*, Pl. 54, fig. E, F.—*Roesel's Ins.* i, Pl. 10, fig. 1, 2; *Merian, Ins. Surin.* Pl. 8.—Le Papier Marbré de la Chine, *Daubenton*, Pl. enl. 92, fig. 7, 8.

Bears considerable resemblance to the preceding on the upper side, the ground colour being glossy black, the whole surface variegated with waved streaks and spots of greenish-blue; these markings frequently assume the appearance of hieroglyphics, and towards the hinder margin of the inferior wings they indistinctly represent a series of oval ocelli. Both sexes have a broad oblique white band across the upper wings, but it is sinuated on the edges, while in the female of *P. Arethusa* the edges are always entire. On the under side the general colour is brown; the upper wings with a triangular red patch at the base, the colour between this and the central white band is black glossed with green; beyond the white band are two rows of white points, one of them lying along the margin. The under wings have the anterior half red, that colour divided by rays of greenish-black, which occupies the whole of the hinder portion, except where it is interrupted by a few

whitish spots. Body coloured like the wings above, greyish beneath, the breast red.

We are indebted to Madam Merian for a representation of the caterpillar, the peculiar appendages of which have been already mentioned. The colour of its body is a delicate green, with longitudinal rays alternately blue and yellow; the pectoral legs black; the head dull yellow. It feeds on the *Jasminum Indicum*. The chrysalis is of a yellow colour.

The insect inhabits various parts of South America, in some places rather plentifully.

MARIUS THETIS.

PLATE XIX. Fig. 1 *.

Pap. Thetis, *Fabr.*—Nymph. Thetis, *Godart.*—Pap. Petreus, *Cramer*, Pl. 87, fig. D, E; *Stoll's Supp.* Pl. 2, fig. 2, A, (caterpillar), fig. 2, B, (chrysalis); *Swainson's Zool. Illus.* Pls. 59 and 110.

This singular looking insect is distinguished generically by the peculiar shape of the wings, and the equally remarkable appearance of the caterpillar. Of the former the posterior edge of the primary pair is concave, and the apex is distinctly truncated; the same edge of the secondary wings has two long linear tails, the anal one shorter and curved outwards, the external long, obtuse at the extremity, and turned somewhat obliquely outwards. The caterpillar is naked, with four long fleshy filaments on the back, and two others projecting from the hinder part of the head; the chrysalis likewise with several projecting filaments.

The Marius butterfly is a native of Guiana and Brazil. The colour of the upper side is tawny, varying somewhat in the shade according to the sex,

* On the Plate the under figure should have been marked 1, the upper 2.



1. Marius Thetis. 2. Fabius Hippona. Guiana

Lizars sc

the surface traversed by three black narrow lines, running obliquely from the anterior to the abdominal margin: near the base, and between the second and third lines are the rudiments of two others, and the costa is likewise black, as well as the posterior margin behind the middle: the under wings are black along the hinder edge, and likewise the tails, and on the anal angle are a few whitish crescents placed over two black points surrounded by a white circle. The colour of the under side is rusty-brown, glossed with violet and pale green, and across the middle of both wings there is a dark oblique line, having a series of black ocellated spots behind it.

The following description of the caterpillar and chrysalis is given by Stoll:—"The head of this beautifully coloured caterpillar is dull yellow, with two short rays and small spots of black. The head is furnished with two long black spines garnished with short stiff hairs. The first five segments of the body are reddish-brown, spotted with black. The belly is white, and the anterior legs black. The rest of the body is reddish-brown; but from the sixth to the eleventh segment, the back is of a beautiful yellow, and bordered on the sides with short black and white rays. The back is armed with four long spines, the last of which, placed on the eleventh segment, is curved backwards, and very similar to the horns with which most of the caterpillars of the Sphinges are provided. The intermediate and posterior legs are yellow. It feeds on the leaves of the Cashew tree (*Anacardium oc-*

cidentale), and transforms into a perpendicular chrysalis of a yellow colour, spotted with black, garnished with black spines on the head, thorax, and back. When the butterfly is about to appear, the yellow colour changes into white.*"

* Supp. to Cramer, p. 10, 11.

FABIUS HIPPONA.

PLATE XIX. Fig. 2.

Pap. Hippona, *Fabr.*, *Donovan*, *Insects of India*.—Pap. Fabius, *Drury's Ins.* iii. Pl. 16, fig. 1, 2; *Cramer*, Pl. 90, fig. C, D; *Stoll's Supp.* (caterpillar and chrysalis.)

This species presents another remarkable form, bearing some analogy to the preceding, but at once distinguished by having only one tail. The hinder margin of the superior wings is dilated, in the middle, into an acute angle; the same margin of the hinder pair is cut in a square form towards the anal angle, and is furnished with an oblique lengthened tail rounded at the extremity. The caterpillar tapers lightly towards the hinder extremity, and has two short obtuse horns on the hinder part of the head. The chrysalis is very short and thick, and without any angular projections.

The butterfly expands from three to three and a half inches, and is coloured somewhat in the manner of certain kinds of Heliconia. The upper wings are black above with two broad bands, that next the base tawny-red, the exterior one yellow, sinuated and oblique, extending from the costa to the projecting angle on the hinder margin of the wing; near the apex are likewise two or three yellow spots. Posterior wings black, with a tawny-red stripe along

the anterior border, and a few white linear marks running transversely along the hinder margin between the tail and anal angle. Beneath, the surface is rust-brown, with pale clouds and transverse bands on the upper wings, and violet reflections on the under pair. Body ferruginous above and brown beneath.

The caterpillar is accurately figured by Stoll, in his valuable Supplement to Cramer's work. It is of a dull green, with a brown or nearly black ray on the back, and spots and short stripes of the same colour on the sides. The head is black, with green rays; on the upper part are two, and on each side of the anterior part of the first segment, three small rounded yellow spots. It feeds on the leaves of a species of Piperis, but only during the night, concealing itself in the day by rolling a portion of the leaf round its body, in order to protect it from the sun. The chrysalis is greyish, tinged with flesh-colour, and marked with small brown spots.

The insect occurs in Guiana, Brazil, &c.



1.2. Catagramma Condomanus.
3.4. ——— Pyramus. } Brazil.

CATAGRAMMA CONDOMANUS.

PLATE XX. Figs. 1 and 2.

Pap. Astarte, *Cramer*, Pl. 256, fig. C, D.—Nymph. Condomanus, *Godart.*—Catagramma Condomanus, *Boisd.*

This genus includes a pretty group of *Nymphalidæ*, which are mostly of small size, and marked with annular lines of bright colours on the under side of the inferior wings. They are pretty closely allied to *Hipparchia*, but are natives of the new world. The wings are ample, and all of them rounded on the posterior edges. In the species referred to, the colour of the surface is black, glossed with violet, the upper wings with two wide transverse red bands, one near the base, the other beyond the middle; on the under wings the interior band is continued nearly to the hinder margin. The under side of the superior wings resembles the surface, but the costa is yellow at the base, and a narrow blue line runs along the outer margin. The under wings are black beneath, having a large oval yellow ring on the disk, enclosing three pale blue points and a short yellow streak: behind this ring there is a curved row of blue dots, succeeded by a yellow line running parallel with the hinder border, and not far from it: at the base of

the wing there is likewise a yellow streak, and the sinuosities on the hinder edge are white.

The individual figured differs slightly from most other examples, in as much as it has two small white spots on the surface of the hinder wings near the anal angle.

This species inhabits Brazil and Surinam.

CATAGRAMMA PYRAMUS.

PLATE XX. Figs. 3 and 4.

Pap. Pyramus, *Drury's Insects*, iii. Pl. 23, fig. 3, 4, (Male); *Stoll's Supp.* Pl. 32, fig. 3, and 3 C.

This prettily coloured butterfly measures about an inch and three-quarters between the tips of the wings. The surface is black, finely tinged with violet, with a broad central common band of bright red, not extending either to the costa or hinder extremity. The under side of the upper wings nearly corresponds to the surface, but they are grey at the base and tip, and near the latter there is an undulating blue line: the under wings dark brown sprinkled with grey, with two whitish spots towards the base, without any vestige of a red band, a curved row of ocellated spots behind the middle, and a waved blue line near the extremity.

The female is black on the surface without any violet reflection, and the red band, which is narrower than in the male, does not extend to the secondary wings. This insect is a native of Brazil. We have placed it in the genus *Catagramma*, without knowing what limits are assigned to the group so called by the continental entomologists, as the name only has yet been published. Perhaps it rather belongs to the division named *Hipparchia*.

Genus MORPHO.

The butterflies arranged together under the above name are, in many respects, the most remarkable of any to which our attention has yet been directed. In size they are superior to all the other diurnal lepidopterous tribes, except the *Ornithoptera*, and many of them rival even that conspicuous group in their dimensions. Although surpassed by many others of their tribe in elegance of form and harmonious blending of colours, they afford examples of as rich tints as are to be found in any other natural objects. The blue which adorns the whole surface of *M. Menelaus* and *Adonis*, has a beauty and lustre which it is impossible to witness without admiration. When flying under the blaze of a tropical sun, the brilliancy of the surface, as contrasted with the dark hue of the under side, as they are alternately displayed, must render them very striking objects. Most of them are from South America, but a few occur in the eastern parts of India and the great islands of the adjacent Archipelago.

The generic characters are more determinate than is the case with many others of this order. The antennæ are slender, linear throughout their whole length, or thickening so insensibly towards the ex-

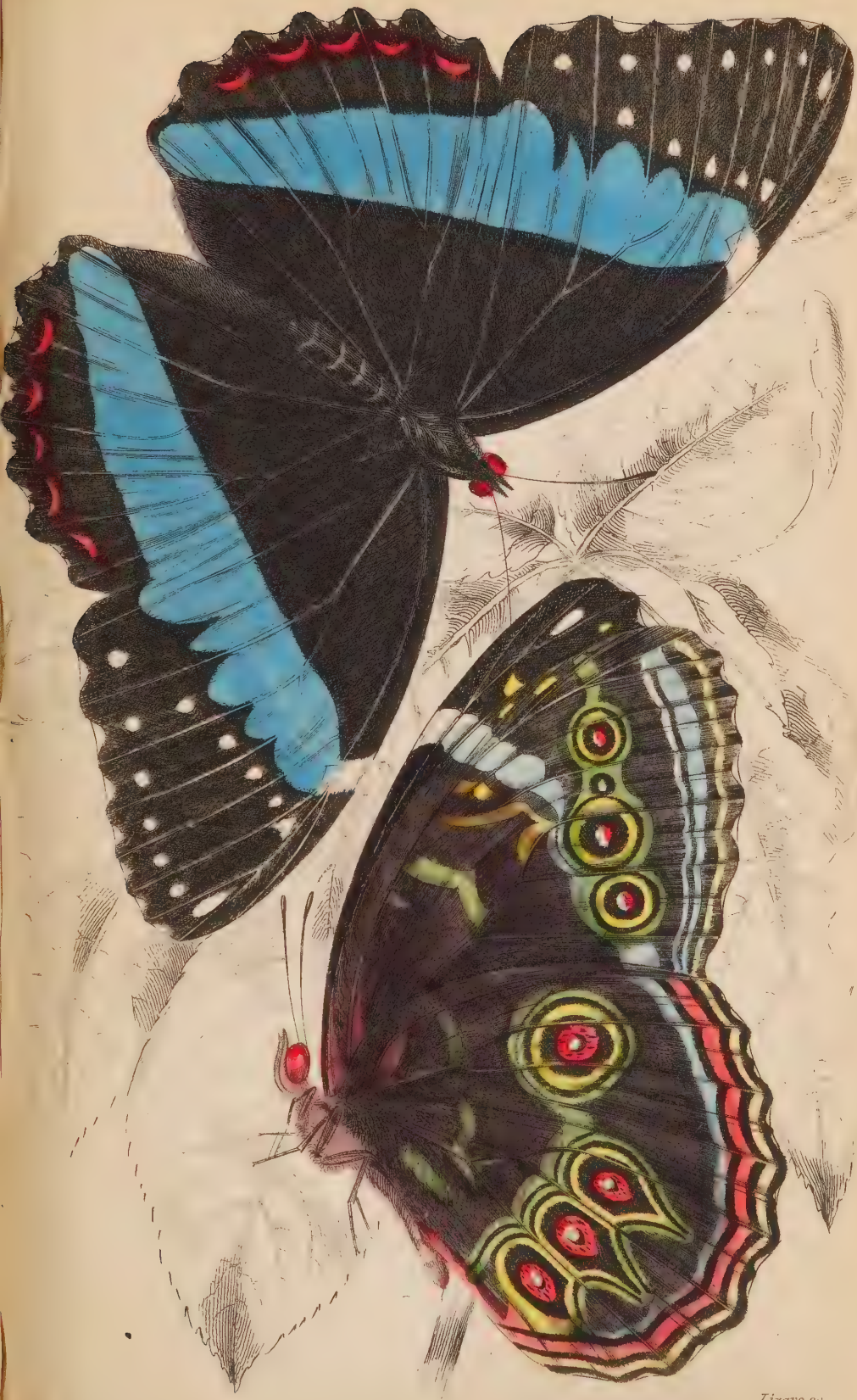
tremity as to deviate but slightly from that shape. The palpi are placed close together, ascending, and clothed with scales, the terminal portion narrow and very much compressed: abdominal margin of the inferior wings curved downwards, and forming a deep groove for receiving the body. Discoidal cell of the posterior wings open behind; claws bifid. The caterpillars vary in form, as well as the chrysalides, and may probably, if more fully known, enable us to subdivide this family into more natural groups.

MORPHO HELENOR.

PLATE XXI.

Godart. — Pap. Helenor, *Cramer*, Pl. 86, fig. A, B; *Herbst. Pap.* Pl. 26, fig. 1, 2; *Esper. Papillon's Exotiques*, Pl. 42, fig. 2.

This affords an example of that section of the genus in which the upper wings are more or less concave on the outer margin, and the inferior pair without any prolongation behind. They are almost exclusively South American. *M. Helenor* expands from four to five inches; surface black, with a broad band of silvery blue or violet blue, extending from the middle of the anterior margin to the anal extremity; sometimes rather narrow and well defined on the inner edge, at other times enlarged to within a short distance of the base of the wings; at the anterior extremity of this band, on the costa, there is an oblique white patch, and beyond it, on the upper wings, a single row of small white spots in the male, and two in the female. The secondary wings have an indistinct row of red crescents near the hinder margin, and the sinuosities in all the wings are white. The colour beneath is dark brown, the upper wings with three large ocelli having a white pupil surrounded with ferruginous and violet, the iris yel-



Lizars sc

Morpho Helenor

From S. America.

low, enclosed in a green circle which has a crescent of the same colour on the inner side; under wings with four similar ocelli, three of them contiguous, the interior one insulated. Towards the base of both wings are several transverse flexuose green stripes, and along the outer edge three greyish lines, more or less interrupted with red, especially in the hinder wings. The body is black above and brown beneath.

In the variety figured there are a few yellow streaks on the under side of the anterior wings, and a red stripe at the base of each wing; at the same time the three posterior ocelli are prolonged into a point, and a spurious ocellus is observable adjoining the anterior one.

Found not unfrequently in many countries of South America.

MORPHO ADONIS.

PLATE XXII. Fig. 1.

Godart.—Pap. Adonis, *Cramer*, Pl. 61, fig. A, B; *Herbst. Pap.* Pl. 26, fig. 3, 4; *Esper. Pap. Exotiques*, Pl. 55, fig. 2.

As a specimen of that division of Morpho which has the upper wings scarcely or not at all concave on their outer edge, and the anal angle of the under pair prolonged into an obtuse rudimentary tail, we have represented a species of great beauty although inferior in size to many of its congeners, the expansion of the wings seldom exceeding three inches and a half. The surface of the male, when seen in certain directions, is of the most brilliant azure-blue, the whole of the exterior margin of the primary wings surrounded with black, and near the apex are two small white spots, the anterior one longitudinal, the other orbicular. In the female the blue colour has not such a high degree of lustre; the posterior margin is widely black, and bears two rows of white spots in the upper wings and one row in the under. On the under side the colour is greyish-brown, with several common oblique bands of a paler hue, and three or four oblong ocelli with a white



Lizars sc.

1. Morpho Adonis. 2. Pavonia Teucer.

Brazil.

pupil and a black iris surrounded by a yellow ring; the anal angle marked with short undulating black lines. Body brownish-black above, concolorous with the same face of the wings beneath.

Found in various parts of South America, but apparently most plentiful in Brazil and Guiana.

Genus PAVONIA.

The group composing this genus was separated from the preceding by Godart, chiefly on account of the discoidal cell in the secondary wings being closed. Besides this character the palpi are not so densely clothed with scales, and the inferior nervure of the upper wings is curved near its origin in the form of the letter S. The species very closely resemble the *Morphos* in most other respects, but their colours are generally less brilliant. They are all from South America, and in that country they are far most abundant in Brazil. The caterpillars of several different kinds have been represented by Madam Merian, and, like those of *Morpho*, they differ from each other in their appearance and properties.

PAVONIA TEUCER.

PLATE XXII. Fig. 2.

Pap. Teucer, *Linn.*—*Merian, Surinam Ins.* Pl. 23; *Cramer*, Pl. 51, fig. A, B.

Extent of the wings from five to six inches; the surface of the primary pair of a livid hue at the base and dark brown at the extremity, the latter colour traversed by a yellow flexuose line near the middle of the secondary wings, slate-blue anteriorly, and black behind. On the under side the wings are very richly mottled, the ground colour being light brown, variegated with numerous undulating black lines, the anterior pair with five very irregular yellowish-white transverse bands, and four ocellated spots near the apex, the hinder one larger than the others, surrounded by a yellow ring and having a white point within, not in the centre, but inclining to the inner side: the secondary pair with three broad indistinct whitish bands, and near the middle three ocelli, the intermediate one minute, the hinder very large and surmounted by a black arch. The body is dark brown above.

This insect inhabits an extensive tract of the warmer parts of South America.

ARPIDEA CHORINÆA.

PLATE XXIII.

Pap. Chorinæus, *Fabr.*—Pap. Arcesilaus, *Cramer*, Pl. 294, fig. A, B (male), fig. C, D (fem.); *Stoll's Supp.* Pl. 6, fig. 1 (caterpillar), fig. 1, A (chrysalis).—Satyrus Chorinæus, *Godart.*

Finding it impossible to include this insect, owing to its remarkable form, in any of the genera hitherto proposed, we have been under the necessity of assigning it a new name. Many of its characters seem to be quite peculiar both in the perfect and preparatory states. The species which makes the nearest approach to it is *Satyrus Philoctetes*, but the differences are considerable, as will be seen by comparing the adjoining figure with that insect. The costal line of the upper wings is very much arched, and the hinder margin is strongly falcate. The external edge of the under wings is likewise falcate posteriorly, and the anal angle is a little produced; the line from that point runs somewhat obliquely nearly to the middle of the hinder edge of the wing, where there is a broad obtuse oblique



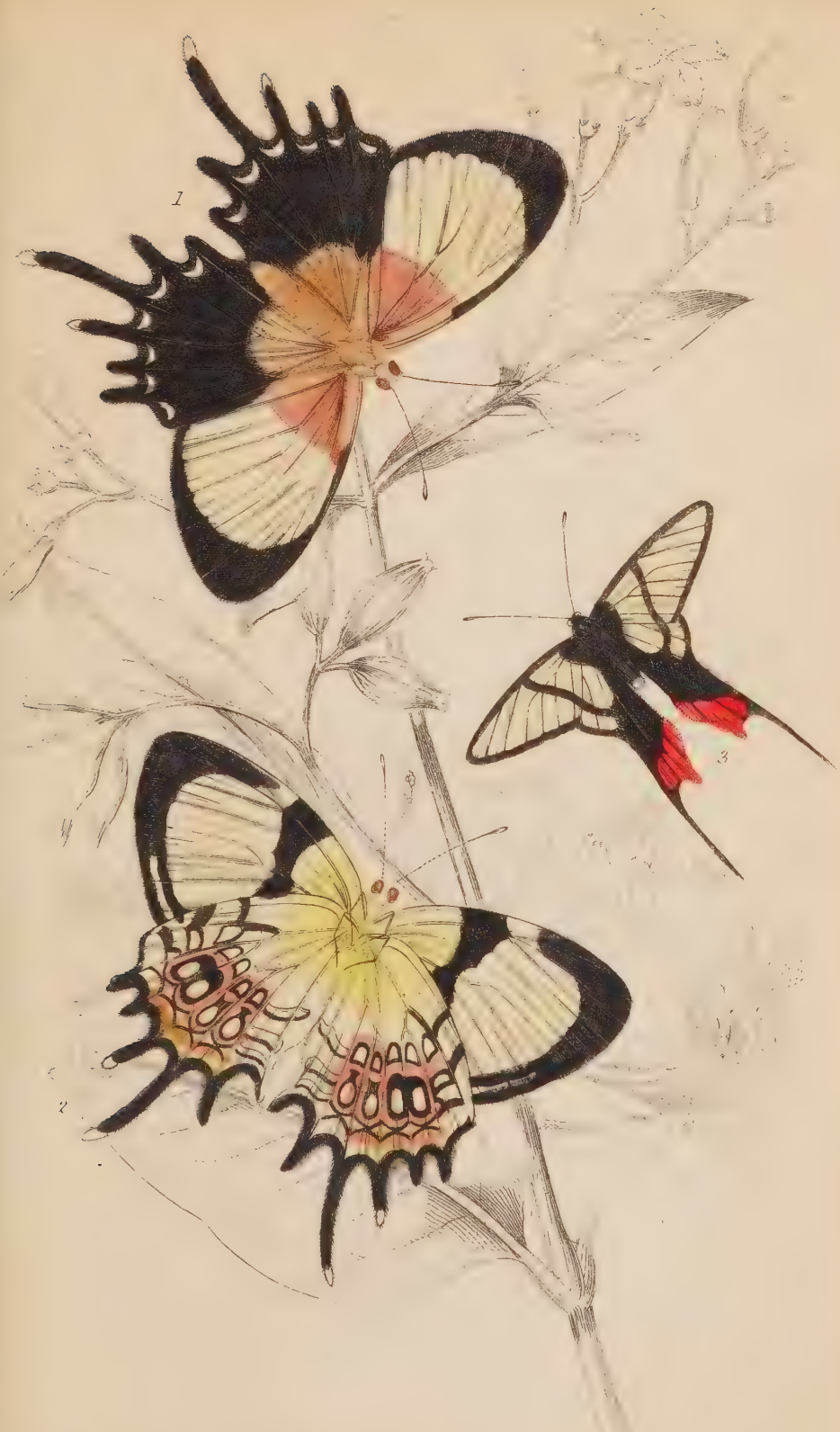
Argynnis Chorinaea
with Caterpiller & Crysalis
Surinam

tail. This outline forms a broad, somewhat square figure, having perhaps rather a heavy appearance, but the curves are graceful. The caterpillar is naked, or covered only with short pubescence, thickest in the middle, and having two very long hairy appendages at the hinder extremity. The chrysalis is short, without any conspicuous projections, the abdominal portion very much incurved.

The colour of the surface in the above species is deep brown, darkest on the upper wings, which have a wide fulvous sinuated band, rather beyond the middle, commencing at the costa and reaching nearly to the opposite side, where it terminates in a point: the costa is likewise yellowish, and towards the apex there is a round white spot. Posterior wings of a lighter hue round the margin than on the disk, and near the hinder extremity an indistinct row of whitish points. On the under side all the wings are light brown and ash colour, covered with short waved lines of dark brown, and bearing several continuous transverse bands of the same colour, and towards the hinder margin of the inferior pair a row of pale rounded spots. Body brown; prothorax with a fulvous mark.

The caterpillar is very beautifully coloured. The body is reddish, inclining to violet, the sides of the belly and the legs dull yellow. Along the back there is a broad yellow band formed of confluent lozenge-shaped spots, each of them having a dusky line in the centre: head ferruginous, bordered and rayed with yellow. The anal fork is grey, with

black ciliæ. This caterpillar feeds on the leaves of the sugar-cane, and changes into a pale brown chrysalis dotted with black, from which the butterfly emerges in about eleven days. The insect is a native of Surinam.



1. 2. Helicopis Gnidus.
3. Erycina Octavius. } Surinam.

Lizars sc.

HELICOPIS GNIDUS *.

PLATE XXIV. Figs. 1 and 2, *Fem.*

Hesperia Gnidus, *Fabr.*—Pap. Endymion, *Cramer*, Pl. 224, C, D, (Male,) E, F, (Fem).—Erycina Gnidus, *Godart; Stoll's Supp.* Pl. 4, fig. 5, A, (Cater), 5, B, (Chrysalis).

The genus Helicopis was proposed by Fabricius in his *Systema Glossatarum*, and he refers to the species above mentioned as one of its typical forms. Although its characters are sufficiently distinctive, it was long confounded with other groups to which it has little relation. It belongs to that section of the diurnal lepidoptera in which the caterpillars are short and depressed, having some resemblance to an *oniscus*, whence they are called onisciform. The palpi are rather long and slender, and the terminal joint is nearly naked or free from scales. In Helicopis the antennæ terminate in a slightly curved club: the anterior legs are much shorter than the others and clothed with hairs; hinder margin of the anterior wings convex and entire, the corresponding margin of the posterior with six linear tails, the central one much longer than the rest; discoidal cell of the posterior wings open behind; claws very minute.

* Owing to the resemblance which this species bears to *H. Cupido*, the latter name has been inadvertently attached to the figure on the adjoining Plate.

Caterpillar thickly clothed with soft hairs, the chrysalis suspended by the tail, and having a band round the middle.

The best known and most common species of this genus is *H. Cupido*, which is rather smaller than *H. Gnidus*. The former is commonly named the Golden-spot, and the latter the Silver-spot Butterfly. The wings of *H. Gnidus*, in the male, are white on both sides, with a slight tinge of yellow at the base, and the outer margin black. At the hinder extremity of the secondary wings there is a row of narrow white marks, which is double at the anal angle; tails black on both sides, the two longest ones tipped with white. The upper wings beneath have a white line dividing the black border behind the middle; and the under pair are ornamented with twenty-one silvery spots, three of which at either extremity are elongated and placed on a white ground, while the rest are insulated and on a ferruginous ground; all of them edged with black. The female is larger than the sex just described, and differs in having a larger fulvous space at the base of the wings, and in having it bounded externally on the under side of the upper pair by a wide black patch; the greater part of the surface of the hinder wings is black, and the posterior row of white crescents is simple: body white, the thorax yellow; antennæ black, ringed with white.

The caterpillar is white, and clothed with long hairs of the same colour; the head yellow, surmounted by a tuft of red hairs. It feeds on the

leaves of the passion-flower, and changes into a brown chrysalis, which has a tuft of red hairs at the head and tail.

This species, as well as *H. Cupido*, is a native of Surinam.

ERYCINA OCTAVIUS.

PLATE XXIV. Fig. 3.

Pap. Octavius, *Fabr. Mant.*—Pap. Faunus, *Fabr. Species.*—Pap. Chorineus, *Cramer*, Pl. 59, fig. A.

As the above genus at present stands, it contains many insects which have but little affinity to each other, as may be seen by comparing the present figure with that on the following plate, both of which have been usually assigned a place in it. If we have not altered this arrangement, it is not because we do not regard it as improper, but from a reluctance to introduce many partial changes, in a place where it would be irrelevant to enter at length on the general subject of classification. The relation which groups bear to each other can be satisfactorily shown only by treating of the whole; and insulated changes are the less desirable at present, as a general arrangement of the whole class will speedily be laid before the public by an individual who has long directed

his attention to the subject. The above-named species belongs to a group in which the upper wings are triangular, and the inferior very much elongated, truncated towards the anal angle, and exteriorly drawn out into a long narrow tail. With the exception of the dark bands and occasional crimson spots, the whole wings are transparent. *E. octavius* expands about an inch and a half. The upper wings are transparent, the whole of the outer margin, and a band running obliquely across the middle, black. Under wings transparent anteriorly, the remainder, including the tail, black; the anal angle with a large crimson patch. The tail is very narrow, and somewhat whitish on the outer edge and at the tip. The under side resembles the upper, except that the red spots are each marked with two white points.

Found in Surinam.



1. 2. Erycina Melibaeus.
3. Loxura Alcides.

1 & 2 from Brazil. 3 Africa.

Lizars sc

ERYCINA MELIBÆUS.

PLATE XXV. Figs. 1 and 2.

Pap. E. A. Melibæus, *Fabr.—Herbst. Pap.* Pl. 59, fig. 4, 5.—
Pap. Pyretus, *Cramer*, Pl. 144, fig. A, B.

This beautiful insect belongs to that division of *Erycina* which has opaque wings, and a short obtuse tail to the hinder pair. It is about two inches in extent of wing. The surface is uniform dark brown, with a bright red oblique band running across the middle of both wings, and a large crescent of the same colour near the origin of the tail. On the inner side of the upper wings there is the appearance of another oblique red band, but it is obsolete except at the hinder margin. The under side forms a striking contrast with the surface, the ground colour being black, with two brilliant blue bands, the outer one very broad, the interior somewhat macular, and terminating behind in a red point. Body brown above and black beneath.

Like most of the species constituting the genus *Erycina*, it is a native of the new world, occurring in greatest plenty in Surinam and Brazil.

LOXURA ALCIDES.

PLATE XXV. Fig. 3.

Pap. P. R. Alcides, *Fabr. Mant.*—Hesperia, R. Alcides, *Fabr. Syst.*—Pap. Alcides, *Cramer*, Pl. 96, fig. D, E.—Myrina Alcides, *Godart.*

Loxura includes a few species formerly referred to *Myrina*, and, like the latter, is distinguished from the allied genera by the extraordinary length of the palpi which rise conspicuously above the head, and are, in fact, nearly half the length of the antennæ. The wings are entire on the edges, and the hinder pair are prolonged each into a single tail, placed obliquely. The antennæ increase gradually towards the apex into a lengthened club, and all the ambulatory legs are of the same form in both sexes. The species represented is a native of Guinea. The extent of the wings is about an inch and three-quarters. On the upper side the wings are dark brown, sprinkled very thickly towards the base with shining violet-blue atoms, making the whole inner half of the wings appear of that colour, and the outer margin of the posterior pair behind the middle, as well as the lengthened tail, are of the same hue. Towards the extremity of the upper wings there is a transverse band of a rusty-red colour, but it is very indistinctly defined. Beneath, the colour is tan-

brown as far as the middle of the wings, where there is a narrow yellow line running across the whole surface in the posterior, but abbreviated in the anterior, and placed rather beyond the middle, the space beyond this band covered with a kind of greyish dust. Body brown, the thorax clothed with hairs of the same colour as the base of the wings, antennæ blackish, annulated with white on the under side.

This is an African insect, and seems to be confined to the coast of Guinea. *Pap. Corax* of Cramer (Pl. 379, fig. D, E) seems to be a variety of the female. The individual figured by Boisduval (*Spec. Gen.* Pl. 22) appears to differ considerably from Cramer's figures, as well as Fabricius' and Godart's description: it is represented as having a distinct ocellus at the base of the tail.

POLYOMMATUS MARSYAS.

PLATE XXVI. Figs. 1 and 2, *Male.*

Pap. Marsyas, *Linn. Fabr. Herbst. Pap.* Pl. 296, fig. 1, 2; *Cramer*, Pl. 332, fig. A, B.—Polyommatus Marsyas, *Godart.*

Notwithstanding the numerous groups which have been recently withdrawn from this genus, it still includes a great variety of modifications of form which would amply justify further subdivision. Even the few examples which have been selected for illustration might afford the types of more than one group; but, for the reasons already mentioned, we prefer presenting them according to Latreille's arrangement. Most of these insects are beneath the middle size, they are usually adorned with very beautiful colours on the surface, and ornamented with ocelliform spots beneath, a circumstance which has suggested the name. They are distinguished from the immediately preceding genera by having the palpi of ordinary length, or rather short, and all the legs complete, or adapted for walking, in both sexes. The group to which the first species represented belongs, has the costa of the upper wings more or less arched, particularly towards the base, and the hinder margin of the same wings is very slightly concave, especially in the male. The hinder



1.2. Polyommatus Marsyas.
3.4. ——— Endymion.

Tizian n.

1 & 2 from S. America. 3 & 4. Surinam.

wings have two linear narrow tails towards the anal angle. *P. Marsyas* is a native of Brazil, Guiana, and some other countries of South America. It is greenish-blue on the upper side, changing with the direction of the incident light into violet, the costa and apical angle of the upper wings widely black. Beneath the colour is lilac, glossy, with seven or eight small black spots, surrounded by a white circle, scattered over the disk of each wing; the anal angle bluish-green, with two short white transverse streaks and two pretty large black spots; tails black with the extremity white, the outer one about half the length of the other. Body blue above and whitish beneath. The antennæ, as in most of the Polyommati, are black with pale rings.

POLYOMMATUS ENDYMION.

PLATE XXVI. Figs. 3, 4, *Fem.*

Pap. P. R. Endymion, *Fabr. Herbst. Pap.* Pl. 298, fig. 1, 2.
Pap. regalis, *Cramer*, Pl. 72. fig. E, F. (Fem).

The outline of this richly ornamented insect perfectly corresponds to that of the preceding species, except that the hinder margin of the upper wings is scarcely concave. The whole disk is very brilliant blue with a tinge of green, surrounded by a black border, which is wide and sinuated on its inner edge in the female, and narrow in the other sex. The anal angle of each of the hinder wings bears a large blood-red mark, and the tails are black tipped with white. On the under side the green hue predominates, and the whole is thickly powdered as it were with gold dust, giving it a very rich appearance. Near the middle both wings are traversed by a distinct black line, angular posteriorly, and bordered externally by pale blue: behind this, on the under wings, there is a broad deep red or ferruginous band, paler towards its hinder edge and sprinkled with blue atoms: the outer margin of all the wings is darker than the interior. Expansion of the wings about two inches.



1.2. Polyommatus Venus.
3.4._____ Achaeus. } Surinam.

Lizars sc.

POLYOMMATUS VENUS.

PLATE XXVII. Figs. 1, 2.

Pap. P. R. Venus, *Fabr. Mantissa.*—Hesperia R. Venus, *Fabr. Systema.*—Pap. Venus, *Herbst. Pap.* Pl. 294, fig. 1, 2. Pap. Imperialis, *Cramer*, Pl. 76, fig. E, F.

This beautiful little insect is not unlike the preceding both in its form and colours. It belongs to a section of *Polyommatus*, in which the upper wings of the male are marked with an orbicular spot, of a cottony appearance, and frequently a good deal impressed. The expansion of the wings does not exceed an inch and a half. The colour of the surface is brilliant blue, the costa and outer margin of the wings black, and the disk of each marked with two ferruginous points in the male. Beneath, the colour is likewise green, richly glossed with golden yellow, the anterior portion of the under wings transversely streaked with narrow black marks. The tails are wholly black.

All the examples hitherto brought to Europe seem to be from Surinam.

POLYOMMATUS ACHÆUS.

PLATE XXVII. Figs. 3, 4.

Hisperia R. Achæus, *Fabr.*—Pap. Achæus, *Cramer*, Pl. 352, fig. G, H.—*Herbst. Pap.* Pl. 297, figs. 3, 4.

Nearly the same size as *P. Venus*, and also a native of Surinam. Upper side dark brown, the superior wings with two oval yellow spots on the disk of each, and two transverse curved streaks of the same colour on the inferior, the anal angle with a ferruginous spot. Under side yellow, with numerous ferruginous patches, each of which is ornamented with several small spots of golden-yellow, the outer border with a continuous ferruginous band bearing a series of golden-yellow elongated spots. Body brown above and yellowish beneath.

Genus THALIURA.

The genus to which we have assigned the above name has been hitherto blended with the *Uraniæ*. It is doubtless very closely connected with these insects; but the differences both in the appearance of the perfect insects and the respective caterpillars, render it expedient that they should be separated. The character by which it and *Urania* are widely separated from all others, is the form of the antennæ, which are filiform nearly to the middle, where they thicken a little, and from that gradually narrow to a point. The palpi are lengthened and slender, having the second joint greatly compressed, the terminal one more slender, nearly cylindrical, and naked. There is no closed discoidal cell in any of the wings, and almost all the nervures diverge from the base. Not many different kinds are known, and, with one exception, they are natives of America and the West Indian Islands. Their splendid tints of golden green arranged in transverse bars, render them perhaps the most chastely beautiful insects that exist, and has caused them to be named Emerald Butterflies in this country. Sometimes also they are called *Pages*. They fly so high in the air and with so much velocity, that it is nearly impossible, Madam Merian informs us, to catch them,

and the only way therefore to obtain good specimens, is to feed the caterpillar. "Great numbers of this insect," says Mr. Swainson, speaking of a species almost the exact counterpart of *U. Leilus*, "were flying during the whole of the morning, past *Aqua Fria* (Pernambuco) in a direction from north to south: not one deviated from this course, notwithstanding the flowers which were growing around: they flew against the wind, which blew rather strong, and near the ground, but mounted over every tree or other high object which lay in their course; yet their flight was so rapid, that I could not capture a single specimen. They went singly, and near fifty or sixty must have passed the spot opposite the window before mid-day: they continued to pass for three or four days in this manner. 12th June 1817*."

The present genus differs from Urania in the perfect insect having three distinct tails at the hinder extremity of the posterior wings; neither are these wings so much elongated as in the group just named. The differences between them in their early states will be seen by comparing the following descriptions.

* Zoological Illustrations, 126.



Lizars sc

Thaliura Rhipheus.
Madagascar

THALIURA RHIPHEUS.

PLATE XXVIII.

Pap. E. A. Rhipheus, *Fabr.*—Pap. Rhipheus, *Cramer*, Pl. 385, fig. A, B.—*Boisduval, Nouvel. Annal. du Museum d'His. Nat.* p. 260, Pl. 8, fig. 1, 2.

This magnificent species is usually about the size of *Papilio Machaon*, but sometimes it is a good deal larger. The surface is a deep velvet-black; the upper wings with numerous transverse lines and stripes of beautiful golden-green, and a broad band of the same colour near the middle deeply cleft anteriorly: this band is likewise continued across the under wings in the direction of the anal angle, but a large space on the latter is brilliant coppery-red with a violet reflection, and marked with four or five black spots; besides this there is another green band near the external margin, the outer edge as well as the tails fringed with hairs: the tails are three in number. that most remote from the anal angle longer than the others. On the under side of the superior wings the green bands are dilated so as to occupy greater part of the surface; the same side of the inferior pair is gilded green at the base and extremity; the whole anal region bright flame colour inclining to purple, with a changeable lustre, prolonged to

the anterior margin and forming a central band, the whole surface marked with orbicular black spots, which become larger posteriorly. Body black, fulvous beneath: antennæ wholly black.

The female is about one-third larger than the male, the anal mark larger and of a golden colour with little mixture of purple.

"This species," says M. Boisduval, who first completed the natural history of this insect by describing its various states and metamorphoses, "which may be considered as the most beautiful lepidopteron known, inhabits Madagascar. It has been once taken in Bourbon, whither the caterpillar had probably been transported accidentally. According to Cramer it is likewise found on the coast of Coromandel.

"The caterpillar lives on the *Mangifera Indica*. On first issuing from the egg, it is nearly smooth and of a greenish tint; after the first moult it assumes a black colour, becomes covered with spines, and protrudes at pleasure two rose-coloured retractile horns, placed on the first segment. Having attained its full size it is rather slender, dilated laterally towards the middle, and is about two or three inches long. On each side there is a festoon composed of many irregular bands of white, green, and yellow points: the horns, which were of a delicate rose-colour, become carmine-red; the first pair of membraneous legs becomes very short, almost rudimentary, and are of no use in walking; when in motion, therefore, it curves the centre of its body

upwards into a loop like the caterpillars of *Geometra* and *Catocala*. Before undergoing its metamorphoses, it attaches itself by the tail and a band round the middle, like the caterpillars of *Papilio*, *Colias*, *Pieris*, &c., or rather like those of *Geometra pendularia* and *Gyraria*.

" The chrysalis is elongated and pointed, scarcely angular, of a green colour with a transverse gilded band; the extremity, which is of a deeper green, is sprinkled with a great number of golden points.

" The perfect insect comes out in about three weeks. Exposed to the sun, it developes itself completely in two or three hours, while individuals born in the shade take nearly a day to develope themselves, and are usually less brilliant."

Genus URANIA.

As already mentioned, *Urania* is distinguished from all other groups, except Thaliura, by the shape of the antennæ, and an obvious character for separating it from that is the presence of only a single tail. The palpi are short and project a little beyond the head, the terminal joint being nearly naked. The tibiæ of the anterior legs are furnished with spines in the middle; and the claws are minute. When at rest the anterior wings are kept in a horizontal position, or but slightly turned upwards; one peculiarity among many others in which they resemble the nocturnal lepidoptera. We are indebted to Mr. Macleay for an account of the metamorphoses of a species which he has named *U. Fernandinæ*, but which is probably synonymous with some previously known. The caterpillar feeds on a kind of *Omphalea* which grows abundantly on the sea-coast of Jamaica. It never appears during the heat of the day, but reposes in a torpid state within a thin transparent web on the under side of the leaves, in order to avoid the rays of the sun. Its only time of feeding is during the night. In its appearance and habits it shows more affinity to the larvæ of the Bombycidæ than to the diurnal Lepidoptera. When about to change to a chrysalis

it spins an oval cocoon of yellow silk, the meshes of which are so lax as to allow the inmate to be easily seen. The pupa is not at all angular. "The perfect butterfly," he adds, "is perfectly diurnal, and very swift in its flight. It is not found in the interior of the island, but it may be seen in plenty as far as two or even three leagues from the coast, sporting in the sun, and sucking the flowers of *Cestrum diurnum*, *Ehretia tinifolia*, and other odoriferous trees of small stature. In hot weather and about mid-day it flies particularly high, and may be even observed surmounting the tops of the highest members of the forest. In the afternoon I have often seen it sport about some capriciously chosen spot, such as a particular branch of Mango, where it would always return to alight on almost the same leaf, in a manner that has sometimes reminded me of a well known habit of the *Musicapæ*. Thus does our insect spend whole hours until sunset, when the bats usually terminate its diversion and its life. On the approach of winter it may be seen at times alighting on hedges, when specimens are more easily captured. The flight, however, of *U. Fernandinæ* is always strong, and it starts like the *Fringillidæ*. When it alights on a leaf, all the four wings are expanded horizontally; and rarely, if ever, take a vertical position, like those of the species of the Linnæan genus *Papilio*, when at rest*."

* Trans. of Zool. Society of London, i. p. 187.

URANIA SLOANUS.

PLATE XXIX. Fig. 1.

Godart.—Pap. Sloanus, *Cramer*, Pl. 85, fig. E, F.—Pap. Leilius, *Var. Fabr.* — Leilius Occidentalis, *Swainson*, *Illus.* Pl. 129.

Expands about two inches and a half or three inches; surface deep black; the upper wings each with six or seven transverse lines of golden green, and near the middle a band of that colour bifid (sometimes trifid) anteriorly. Under wings with a central band of bright coppery red, irregularly indented, the abdominal margin more or less gilded green; the tail black with a few emerald green spots. Design on the under side corresponding to that on the surface, the green paler. Body black above, with a dorsal line of golden green, and another on each side; brownish beneath.

This handsome species bears the name of the celebrated Sir Hans Sloane, the early historian of Jamaica, who figured it in his work (Pl. 239, fig. 11, 12). It is accounted a rare insect, and, we believe, has hitherto been found only in the West Indian Islands.



Lizars sc.

1. Urania Sloanus. 2. Urania Leilus.

W. Indies. Surinam.

URANIA LEILUS.

PLATE XXIX. Fig. 2.

Pap. Leilus, *Linn. Fabr. Cramer*, Pl. 85, fig. C, D; *Merian's Surinam. Ins.* Pl. 29.—Urania Leilus, *Fabr. Syst. Gloss.*—Leilus Surinamensis, *Swainson. Zool. Illus.* Pl. 125.—Le Page de Cayenne, *Daubenton*, Pl. enlum. 71, fig. 1.

Larger than the preceding, frequently expanding four inches. Ground colour deep velvet black on both sides, the pictorial design on the upper wings nearly as in *U. Sloanus*, there being eight or nine slender transverse lines, slightly curved, of beautiful green, with a silky lustre, and the usual band near the middle sometimes divided into three or four ramifications as it approaches the costa. A band of light sericeous green likewise runs across the inferior wings, deeply indented on both sides, and often quite interrupted by transverse patches of the ground colour; the tail nearly white; the fringe pure white. Body thick and robust, especially in the females; black, rayed with emerald green.

This lovely insect appears to be pretty abundant in Surinam, as great numbers have been transmitted to this country.

Although the butterfly seems to occur so frequently, we are not aware that the caterpillar has

been noticed by any competent observer since the time of Madam Merian, at least no notice of it has been published since. It was long suspected that her figure of it was unworthy of credit, but from what has been recently observed in relation to the larvæ of kindred species (particularly that of *T. Rhipheus*), it now appears probable that her information was correct. Anomalies similar to those which characterise the perfect insects, likewise attend them in their previous state. They are covered with spines, as is the case among many of the *Nymphalidæ*, and they are provided with a retractile tentaculum as in *Papilio*. In the present instance the spines are remarkable for their length and rigidity, particularly those on the anterior and posterior segments.



Lizars sc.

Rhipheus Dasycephalus
From China.

RHIPHEUS DASYCEPHALUS.

PLATE XXX.

Urania Rhipheus, *Var. Cramer, Godart.*—Rhipheus Dasycephalus, *Swainson, Zool. Illus.* Pl. 131.

We have copied the accompanying figures from Drury's work on exotic insects, in order that they may be compared with those represented on Plate XXVIII. It will at once be perceived that they present numerous points of agreement, as well as very obvious differences, and when every consideration is taken into account, it is not easy to say whether they ought to be regarded as distinct species, or merely varieties of the same. Drury states that his insect was brought from China, and when the drawing was taken, it was in the possession of Captain May of Hammersmith; in all probability, however, it is now lost. The antennæ are described as black and knobbed at their extremities, and the hinder wings are without tails.

On the supposition that Drury's figures accurately represent the insect as it appeared when alive, the only connexion which it has with Urania arises from the similar distribution of colours and neuration of the wings; in other respects it would be

classed with the *Papiliones*. But this anomaly is certainly a remarkable one, that it should combine clavate antennæ, with an arrangement of the alary nervures exactly corresponding to an insect with which in other respects it is so nearly identical. There being no other example of such a peculiarity, and the insect figured by Drury never having been found since, we are naturally led to suspect that he has been, in some way or other, under error. We have no doubt, however, that his figures afford a faithful representation of the *specimen* from which they were taken, as the drawings were made by Moses Harris, whose accuracy in such matters is well known. But there seems good reason to believe that the specimen in question has been originally defective, and that improper means have been taken to supply its deficiencies. By supposing that the head of a genuine papilio had been attached, in order to supply the want of that part in the specimen, and give it the appearance of being complete (a practice which has often been followed by amateur collectors), we get rid of the greatest objection to its being considered identical with *Rhipheus*. The want of the tails is easily accounted for, these appendages being so brittle when dry, that they are seldom preserved except in specimens which have received the utmost care. In other instances Drury has erroneously represented species as destitute of tails; we recollect in particular *Satyrus Philoctetes*. We mention these circumstances as affording means by which it is possible to account for the peculiari-

ties presented by Drury's figure; but it is likely that different opinions will be held on the subject. The following are Mr. Swainson's observations:—

"If the imagination was taxed to invent, or to concentrate into one figure all that was splendid, lovely, or rare in the insect world, Nature would far exceed the poor invention of man by the production of this incomparably splendid creature; its rarity also is so great, that but one specimen has ever been seen. It is not, however, on this account only that we have been induced to copy this figure, but because its illustration will clear up one of the most intricate and perplexing questions that has hitherto impeded the natural arrangement of the Linnæan *Papiliones*, and even of the whole order of the *Lepidoptera*.

"The error of Cramer regarding *Rhipheus* has already been rectified. It will now be demonstrated that not only are the two insects distinct as *species*, but that they actually belong to different *genera*; Cramer's being a *Urania* of Fabricius and Latreille, while Drury's is a *Papilio* of the same authors. This is proved by the figures, and confirmed by the following words of Drury:—'The antennæ are black, and knobbed at their extremities,' in other words, clavate; while the palpi, as expressed in the figure, are so small as not to project beyond the head, where they lie hid among the frontal hairs; this also being a typical distinction of the Latreillian *Papiliones*. The figures in Drury's work were all drawn and engraved by Moses Harris, well known

as one of the most accurate artists that ever lived; as a remarkable proof of this, we find that he has not failed to delineate that peculiar neuration of the anterior wings which belongs only to the types of *Leilus*. A closer affinity therefore between *Papilio* and *Leilus* cannot possibly be imagined; while its remarkable hairy front points out its analogy, as an aberrant type in its own genus, to *Chlorisses* among insects, and *Dasycephala* among birds. So true it is that the natural system 'illuminates with a flood of light' every supposed anomaly, and reconciles facts apparently the most inexplicable *."

* Zoological Illustrations, 2d series, 131.

FINIS.

Printed by W. H. Lizars, Edinburgh.